WORK PLAN FOR 2002 DEMONSTRATION
ROCHESTER HARBOR, NEW YORK
SECTION 1135 HABITAT RESTORATION FEASIBILITY STUDY

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1.0 INTRODUCTION

The Federal West Pier, which is part of the Rochester Harbor Navigation Project, was constructed and is maintained by the U.S. Army Corps of Engineers (USACE). The pier projects approximately one-half mile offshore at the mouth of the Genesee River. It blocks the predominant west-to-east current flow in the vicinity, and creates a stagnant zone where debris and algae are trapped. The resulting accumulation, particularly that of algae, creates adverse environmental impacts and results in increased closures of the heavily utilized Ontario Beach, which is located immediately to the west of the pier.

Under contract to the USACE Buffalo District, and as authorized under Section 1135(b) of the Water Resources and Development Act of 1986 (P.L. 99-662), as amended, URS Corporation (URS) prepared a draft Habitat Restoration Feasibility Study for the Rochester Harbor Federal Navigation Project in March 2001. As part of this study, hydrodynamic modeling was used to evaluate various alternatives for improving the poor water circulation and resulting impaired ecological habitat caused by the west pier. In August/September 2001, URS performed a field demonstration to further evaluate the potential effectiveness of several alternatives, including: algae pumping to the Genesee River, improved algae herding operations (by the Monroe County Parks Department [MCPD]), and circulation sluice gates in the west pier. The Summer 2001 demonstration results indicated that algae pumping, combined with improved herding operations, is a feasible alternative. In order to further evaluate this alternative and several others, under conditions of high algae volume, additional demonstration tests are planned during the Summer 2002 season. This document constitutes a work plan for the Summer 2002 demonstration project. The development of the work plan is authorized as Task 2 under Modification No 0011 to Delivery Order No. 007 of Contract No. DACW49-99-D-004 between URS and the USACE.

2.0 PURPOSE AND SCOPE

The purpose and scope of the work plan is to describe the activities that will be performed as part of a pilot-scale demonstration of algae removal technologies at Rochester Harbor during the Summer 2002 season. The work plan includes: a discussion of the overall demonstration project objectives (Section 3.0); an evaluation of scheduling, location and operation constraints that must be satisfied during the demonstration (Section 4.0); a presentation of overall project activity coordination and a schedule providing the sequence and inter-relationship among different activities (Section 5.0); a detailed discussion of each component activity (task) within the demonstration project (Sections 6.0 through 13.0); and a discussion of issues common to all of the work tasks (Section 14.0).

The demonstration project will focus on collecting data that will allow the evaluation of the following technologies in a future phase:

- Existing methods for herding, collection, dewatering and disposal of algae
- Modified algae pushing equipment and procedures
- Algae pumping for onshore treatment and disposal
- Algae pumping for discharge to the Genesee River and Lake Ontario
- Modified equipment to push algae onto the beach
- Use of a hard-surface loading platform
- Off-site composting

The general work plan tasks required to provide the data for technology evaluation are as follows:

- Measurements of algae and related environmental parameters (Section 6.0)
- Algae herding efficiency (Section 7.0)
- Algae pumping (Section 8.0)
- Algae pushing to shore and handling on hard-surface platform (Section 9.0)
- Algae screening (Section 10.0)
- Algae dewatering (Section 11.0)

- Off-site open-air composting (Section 12.0)
- Plume delineation modeling (Section 13.0)

3.0 DEMONSTRATION PROJECT OBJECTIVES

The overall objective of the Summer 2002 Demonstration Project is to perform field tests of sufficient scope, and to generate sufficient data from those tests, to permit an evaluation of the feasibility and effectiveness of various algae collection, handling and disposal technologies at Ontario Beach, as described in the previous section. Each of the principal activities (tasks) included in the demonstration project is described separately in Sections 6.0 through 13.0, along with a statement of the specific objective(s) for that task.

4.0 CONSTRAINTS

Key constraints were identified based on discussions with the USACE, Monroe County and the City of Rochester. The constraints provide the working parameters within which the demonstration will be completed. Three main groups of constraints were identified: schedule of the work, the locations where the demonstration efforts will take place, and operational issues.

4.1 Schedule Constraints

Scheduling of the 2002 Demonstration is critical to provide the greatest probability of encountering significant quantities of algae, and to capture the widest range of algae conditions (e.g., type of algae and state of decay) typically experienced. To satisfy these constraints, a primary goal will be to begin the demonstration by June 15, 2002 and continue it through August 15, 2002. Historically, this interval encompasses a broad range of algae quantities and conditions at Ontario Beach.

Ideally, all of the pilot-scale demonstration equipment would be onsite throughout the entire demonstration period to allow pilot testing under all algae conditions. However, several factors make this ideal situation untenable. First, the cost to lease and operate all of the equipment for a period of two months would be very high. Second, much of the equipment required for the demonstration is large, some of it requiring an 8-foot by 40-foot trailer. Maintaining this equipment onsite for the full two months would increase the potential for infringement on public use of the beach, and also increase safety and site security concerns. Finally, lead-time requirements may not allow all of the equipment to be delivered to the site by June 15th.

Pilot-testing tasks and equipment will be scheduled to minimize infringement on beach use, satisfy lead-time requirements, and reduce costs to the extent practical. Based on these objectives, the pilot testing equipment will be used to evaluate technical and operational feasibility. Supplemental bench-scale testing will also be incorporated to fill in data gaps and allow a wider range of algae conditions to be tested.

Bench-scale testing will provide an additional advantage. The manufacturers of the screening and dewatering equipment to be used during this demonstration recommend that bench-scale testing be provided to allow a more focused pilot-scale evaluation. For example, a sieve analysis will be performed (by URS) to identify screen mesh sizes most suitable for algae conditions at Ontario Beach. Also, "leaf" testing will be performed (by the manufacturer) to determine conditioning requirements for a belt filter press. These bench-scale tests will be performed from approximately June 15th to July 15th, with the results used to provide information for a more focused pilot-testing program, which will occur between approximately July 15th and August 15th.

Daily scheduling must also be considered with respect to maintaining operation of the beach and minimizing nuisances to the public. The beach opens daily at 10:00 a.m. Park personnel typically perform algae herding operations between 6:00 a.m. and 9:30 a.m. Other maintenance activities, such as removing algae from the water, continue until about 2:00 p.m., when the 8-hour shift of the maintenance staff ends. The number of people in the park peaks after 3:00 p.m., and evening events are frequently scheduled. As expected, park use increases substantially on weekends and holidays. Based on these schedule constraints, the demonstration project will adhere to the following guidelines:

- The evaluation of algae herding equipment will generally be limited to the morning hours between 6:00 a.m. and 9:30 a.m.

- Working hours on the east end of the beach (adjacent to the west pier) will be between 6:00 a.m. and 3:00 p.m.

- Work will generally be performed on weekdays.

The above schedule guidelines may, with prior concurrence by Monroe County, be deviated from on a case-by-case basis. For example, during periods when the beach is closed for water quality reasons, a request may be made to the MCPD to allow testing of herding equipment until 3:00 p.m. Also, if a heavy algae event occurs during the weekend, a request may be made to

perform weekend work. Coordination with the MCPD would be required, since the department's equipment operators might be required to work overtime hours.

4.2 Location Constraints

Most of Ontario Beach was available for use during the Summer 2001 demonstration. However, significant changes at the site this year, plus the evaluation of different alternatives, pose several location-oriented constraints on the Summer 2002 Demonstration Program. These constraints are summarized as follows:

- The City of Rochester will be commencing a large construction project at the park in Summer 2002 to install facilities for a fast-ferry to Toronto, Canada. As shown in Figure 4-1, this project will encompass a large part of the park, including Beach Avenue, the main parking lot and part of the park south of the carousel. Discussions with the City of Rochester indicated that construction would not occur on the beach, where most of the demonstration will be performed. Additionally, the County boat launch will not be affected, and a portion of the elevated parking lot can be made available as a staging area. However, demonstration equipment will need to be transported through the construction zone to access the beach. City personnel also noted that CSX might be using its property near the park maintenance garage for another construction project. Therefore, performance of the demonstration project will need to be coordinated with these two construction projects, primarily with the fast-ferry project. URS will provide close coordination with the City's Construction Manager to schedule access of demonstration equipment through the construction zone. This will include submittal of the work plan for information, expected work locations and meetings as required. With close coordination, the City does not anticipate the demonstration project will interfere with its construction work.

- Because of concerns about odors, stand-alone compost testing will not be performed at the park. Rather, it will be performed at the Gates-Chili-Ogden Wastewater Treatment Plant.

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2002 DEMONSTRATION AND ONTARIO BEACH PARK CONSTRUCTION WORK AREAS

FIGURE 4-1

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- Likewise, co-composting will be performed at the Town of Greece Yard Waste Compost Facility.

- It is anticipated that the west pier will not need to be closed for any of the work. However, temporary use of the pier may be required for various demonstration tasks.

- Pilot testing equipment will be located at the far eastern quadrant of Ontario Beach. This area will be fenced and security will be provided. Sketches of the area required for the demonstration are provided in Section 5.0. Algae herding equipment will be tested across the entire beach.

4.3 Operational Constraints

There are several key operational issues and constraints associated with the Summer 2002 Demonstration Program. They include the following:

- Public safety around equipment. The public will need to be notified about the extent and duration of the demonstration. A site fence will be placed around the entire worksite for the duration of the project. Currently, it is not expected that the west pier will require closure. Any vehicles and equipment brought onto the pier will be attended until removed. Signs will be placed on the fencing to warn the public against entering the work site. In addition, a 24-hour security service will be provided when equipment and stored materials are located on the beach.

- Public relations. The USACE and Monroe County will be responsible for addressing public relations during the demonstration program.

- Accident prevention plan. Accident prevention will be addressed in a separate document. URS will prepare an accident prevention plan prior to the start of field work. URS subcontractors will either adopt the URS plan, or develop their own compliant accident prevention plan. Kickoff safety meetings will be conducted prior to the first and second phases of the demonstration program (see Section 5.0), and

site safety meetings will thereafter be conducted periodically as required and specified in the accident prevention plan.

- Contact list. A contact list will be developed by URS prior to the commencement of field work in mid-June 2002.

- Site security. Twenty-four hour site security will be provided when equipment and materials are stored on the beach.

- Fuel oil storage and transport. During the demonstration, a portable generator and pumps will require fuel oil. Fuel oil will be stored in tanks built into the equipment furnished by the suppliers. Spill containment will be provided around these tanks. A fuel oil vendor will be contacted to refill the tanks as required.

- Chemical storage and use. Chemicals will be brought to the beach for conditioning the algae, or for cleaning the screens or filter press. Because the equipment is designed for pilot testing, only small quantities of chemicals are anticipated. Chemicals will not be stored at the beach, but rather by Monroe County at either the Ontario Beach Maintenance Garage or the Environmental Health Laboratory. Chemical needs are discussed in the applicable work plan section(s). Containment will be provided when the transfer of chemicals into the pilot-scale equipment is required.

- Police and Fire Department notification. The police and fire departments will be notified prior to the commencement of demonstration activities. URS and Ontario Beach maintenance personnel will be responsible for notifications.

- Regulatory Agency notification. The New York State Department of Environmental Conservation (NYSDEC) will be provided with a copy of this work plan to confirm that all environmental regulations are being maintained throughout the demonstration. Contact with the NYSDEC will be through the USACE.

- USFWS Monitoring: A USFWS biologist will be on site at certain times during Phase 2 of the demonstration (July 16 through August 16) to observe the algae pumping tests and assist in the identification of algae and entrained aquatic organisms. Contact with the USFWS will be through the USACE.

5.0 ACTIVITY COORDINATION AND SCHEDULE

This section describes the overall schedule and coordination requirements for implementing the Summer 2002 Demonstration Program, and how the individual work tasks will be interfaced. Specific requirements to complete each of the demonstration work tasks are described in Sections 6.0 through 14.0.

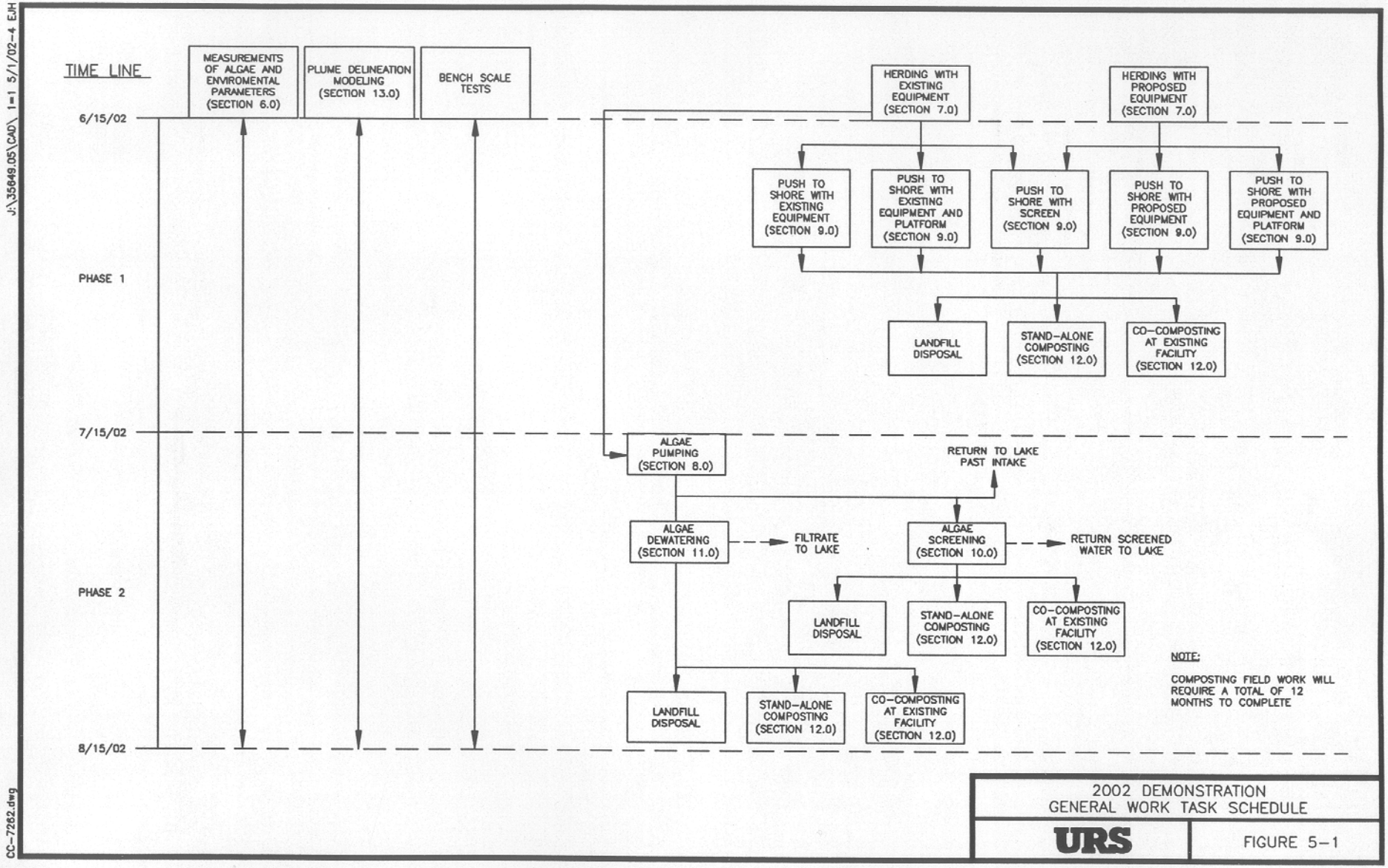
To address the schedule constraints discussed in Section 4.1, the 2002 Demonstration has been divided into two phases. Phase 1, whose primary focus is upon algae herding and pushing technologies, runs from approximately June 15th to July 15th. Phase 2, which focuses primarily upon algae pumping, screening and dewatering operations, runs from approximately July 15th to August 15th. Figure 5-1 provides a general work task schedule showing when each of the demonstration tasks described in Sections 6.0 through 14.0 will be performed. Scheduling of the tasks was based on the following considerations:

- Algae measurements will be performed during both phases because of the need to characterize the dynamic algae conditions throughout the summer, and provide quantitative estimates of algae mass and volume.

- Plume delineation modeling will also span both phases, since it requires current measurements to be obtained early in the summer for hydrodynamic modeling, and measurements of pumped algae (Phase 2) for water quality modeling.

- The manufacturers of the rotary drum screens and belt filter presses recommend bench-scale testing prior to conducting pilot tests. Bench-scale testing during Phase 1 will allow information to be obtained to refine the operational and data collection plan prior to delivery of the pilot-scale screening and dewatering tests scheduled for Phase 2. Bench-scale tests will be continued in Phase 2 to supplement pilot test data.

- The equipment required for the algae herding and pushing evaluations (e.g., loaders) is available for rent on relatively short notice, and can be obtained for Phase 1 activities. However, the pilot-scale rotary drum screens and belt filter press have



2002 DEMONSTRATION
GENERAL WORK TASK SCHEDULE

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FIGURE 5-1

longer lead times required for rental, and also involve more time for set-up and mobilization. For this reason, they have been scheduled for Phase 2.

- The composting work task will involve evaluation of algae pushed onto shore, passed through a screen and dewatered. Therefore, composting will be performed during both phases of the project.

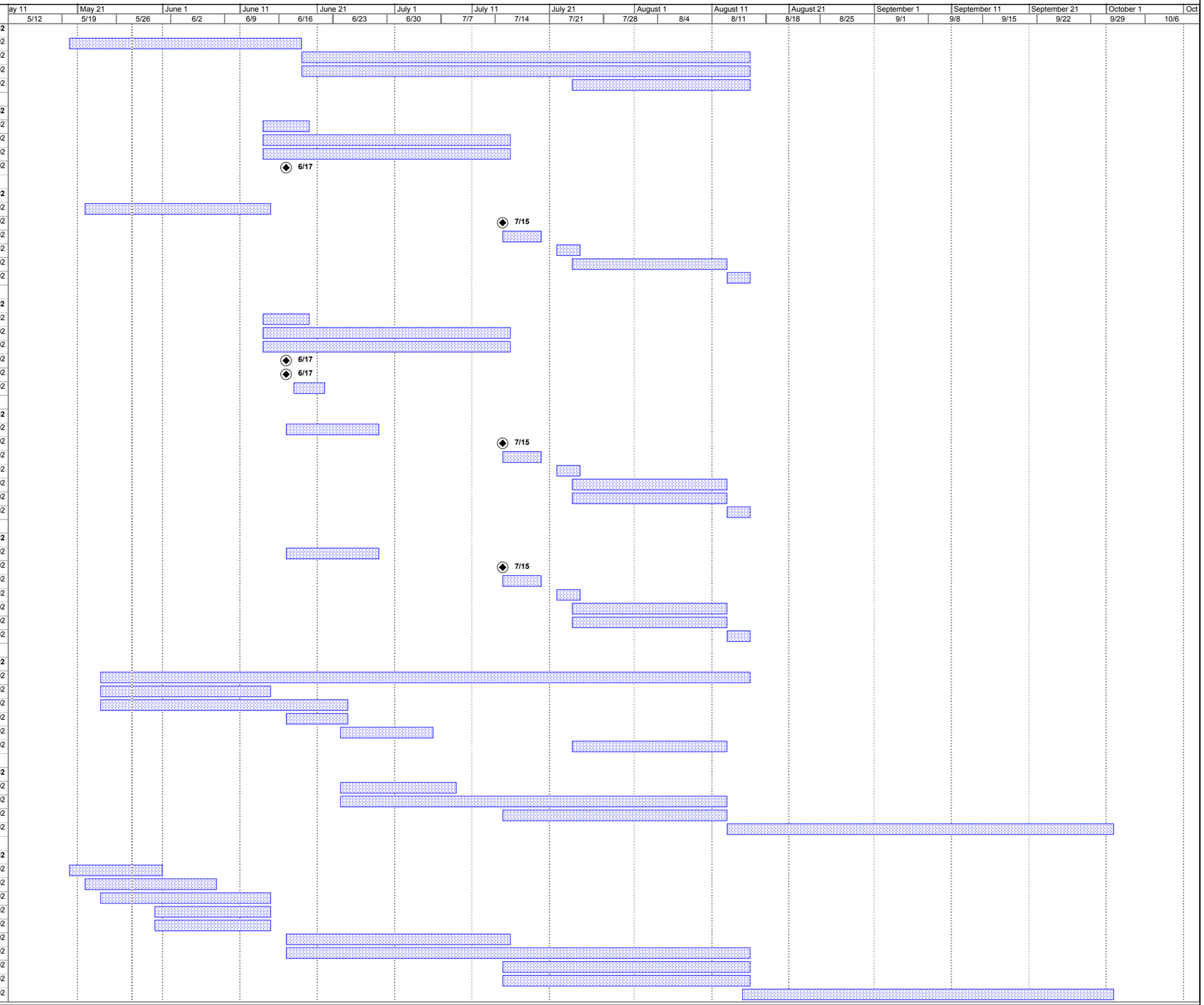
It should be noted that the schedule shown in Figure 5-1 relates to the actual performance of field work only. Figure 5-1A presents a schedule for completing key elements of the work tasks for the 2002 Demonstration. These elements include preparation for the field work and data compilation.

Phase 1 will include the herding efficiency evaluation with existing and proposed equipment and the evaluation of pushing algae to shore using existing methods, with the assistance of a hard-surface platform and with an algae collection screen. Figure 5-2 shows the general location where Phase 1 of the demonstration will be conducted. The algae herding evaluation will occur along the western three sections of Ontario Beach (west, central and east), and the algae pushing evaluation will occur in the far east quadrant. Material for the composting tests will be transported to the Gates-Chili-Ogden Sewage Treatment Plant and to the Town of Greece Yard Waste Composting Facility. The remaining algae will be handled and removed from the site by Monroe County personnel using their existing procedures.

Phase 2 of the demonstration will include pumpability testing, and the evaluation of algae screening and algae dewatering. For this phase, the MCPD's existing equipment will be used to herd algae to the pump intake as part of normal algae beach maintenance operations. The demonstration equipment and appurtenances will be confined to the far east section of the beach between the gazebo and pier, as shown on Figure 5-3. The work area will be fenced-off and warning signs will be posted. The schematic design and inter-relation of the Phase 2 demonstration facilities are shown on Figure 5-4, including equipment, intake and discharge piping, drains, potable water facilities and power generation and distribution equipment. Specific components and design requirements are described subsequently in the applicable sections of this work plan. As with Phase 1, material for the composting tests will be transported to the Gates-Chili-Ogden Sewage Treatment Plant and to the Town of Greece Yard Waste Composting

2002 DEMONSTRATION TASK SCHEDULE
FIGURE 5-1A

ID	Task Name	Duration	Start	Finish
1	**Section 6.0 - Algae Monitoring**	**64 days**	**Mon 5/20/02**	**Thu 8/15/02**
2	Monitoring Setup	22 days	Mon 5/20/02	Tue 6/18/02
3	Ontario Beach Measurements	42 days	Wed 6/19/02	Thu 8/15/02
4	Composting Measurements	42 days	Wed 6/19/02	Thu 8/15/02
5	Pumped Algae Measurements	17 days	Wed 7/24/02	Thu 8/15/02
6				
7	**Section 7.0 - Algae Herding**	**22 days**	**Fri 6/14/02**	**Mon 7/15/02**
8	Herding Equipment Deliveries	4 days	Fri 6/14/02	Wed 6/19/02
9	Herding Equipment Rental	22 days	Fri 6/14/02	Mon 7/15/02
10	Data Collection	22 days	Fri 6/14/02	Mon 7/15/02
11	Surf Rake Delivery	1 day	Mon 6/17/02	Mon 6/17/02
12				
13	**Section 8.0 - Algae Pumping**	**62 days**	**Wed 5/22/02**	**Thu 8/15/02**
14	Confirm Pumping Requirements	18 days	Wed 5/22/02	Fri 6/14/02
15	Pumping Equipment Delivery	1 day	Mon 7/15/02	Mon 7/15/02
16	Pump/Piping Installation	5 days	Mon 7/15/02	Fri 7/19/02
17	Pump Startup	3 days	Mon 7/22/02	Wed 7/24/02
18	Pump Operation	14 days	Wed 7/24/02	Mon 8/12/02
19	Demobilization	3 days	Tue 8/13/02	Thu 8/15/02
20				
21	**Section 9.0 - Algae Pushing to Shore**	**22 days**	**Fri 6/14/02**	**Mon 7/15/02**
22	Pushing Equipment Deliveries	4 days	Fri 6/14/02	Wed 6/19/02
23	Pushing Equipment Rentals	22 days	Fri 6/14/02	Mon 7/15/02
24	Data Collection	22 days	Fri 6/14/02	Mon 7/15/02
25	Surf Rake Deliveries	1 day	Mon 6/17/02	Mon 6/17/02
26	Algae Screen Delivery	1 day	Mon 6/17/02	Mon 6/17/02
27	Hard Surface Platform Delivery & Install	4 days	Tue 6/18/02	Fri 6/21/02
28				
29	**Section 10.0 - Algae Screening**	**44 days**	**Mon 6/17/02**	**Thu 8/15/02**
30	Bench Scale Testing	10 days	Mon 6/17/02	Fri 6/28/02
31	Screening Equipment Delivery	1 day	Mon 7/15/02	Mon 7/15/02
32	Screen System Installation	5 days	Mon 7/15/02	Fri 7/19/02
33	Screen Startup and Training	3 days	Mon 7/22/02	Wed 7/24/02
34	Bench Scale Testing	14 days	Wed 7/24/02	Mon 8/12/02
35	Screen Operation	14 days	Wed 7/24/02	Mon 8/12/02
36	Demobilization	3 days	Tue 8/13/02	Thu 8/15/02
37				
38	**Section 11.0 - Algae Dewatering**	**44 days**	**Mon 6/17/02**	**Thu 8/15/02**
39	Bench Scale Testing	10 days	Mon 6/17/02	Fri 6/28/02
40	Filter Press Delivery	1 day	Mon 7/15/02	Mon 7/15/02
41	Filter Press Installation	5 days	Mon 7/15/02	Fri 7/19/02
42	Filter Press Startup and Training	3 days	Mon 7/22/02	Wed 7/24/02
43	Bench Scale Testing	14 days	Wed 7/24/02	Mon 8/12/02
44	Filter Press Operation	14 days	Wed 7/24/02	Mon 8/12/02
45	Demobilization	3 days	Tue 8/13/02	Thu 8/15/02
46				
47	**Section 12.0 - Off Site Composting (monitoring will be over 12 mos.)**	**60 days**	**Fri 5/24/02**	**Thu 8/15/02**
48	Coordination with the Town of Greece	60 days	Fri 5/24/02	Thu 8/15/02
49	Compost Bed Design	16 days	Fri 5/24/02	Fri 6/14/02
50	Equipment/Material Acquisition	22 days	Fri 5/24/02	Mon 6/24/02
51	Pre-Composting Analysis	6 days	Mon 6/17/02	Mon 6/24/02
52	Compost Bed Construction	10 days	Mon 6/24/02	Fri 7/5/02
53	Compost Bed Construction	14 days	Wed 7/24/02	Mon 8/12/02
54				
55	**Section 13.0 - Plume Delineation Modeling**	**72 days**	**Mon 6/24/02**	**Tue 10/1/02**
56	Data Collection	11 days	Mon 6/24/02	Mon 7/8/02
57	Model Development	36 days	Mon 6/24/02	Mon 8/12/02
58	Data Collection	21 days	Mon 7/15/02	Mon 8/12/02
59	Model Analysis	36 days	Tue 8/13/02	Tue 10/1/02
60				
61	**Section 14.0 - Project Mobilization / Other Demonstration Elements**	**97 days**	**Mon 5/20/02**	**Tue 10/1/02**
62	Prepare Purchase Orders/Subcontracts	10 days	Mon 5/20/02	Fri 5/31/02
63	Accident Prevention Plan	13 days	Wed 5/22/02	Fri 6/7/02
64	Obtain Demonstration Supplies	16 days	Fri 5/24/02	Fri 6/14/02
65	Develop Daily Goals/Data Tables	11 days	Fri 5/31/02	Fri 6/14/02
66	Fast-Ferry Project Coordination	11 days	Fri 5/31/02	Fri 6/14/02
67	Site Safety Meetings	21 days	Mon 6/17/02	Mon 7/15/02
68	Potable Water Supply	44 days	Mon 6/17/02	Thu 8/15/02
69	Site Security	24 days	Mon 7/15/02	Thu 8/15/02
70	Diesel Generator Use	24 days	Mon 7/15/02	Thu 8/15/02
71	Data Compilation	34 days	Thu 8/15/02	Tue 10/1/02



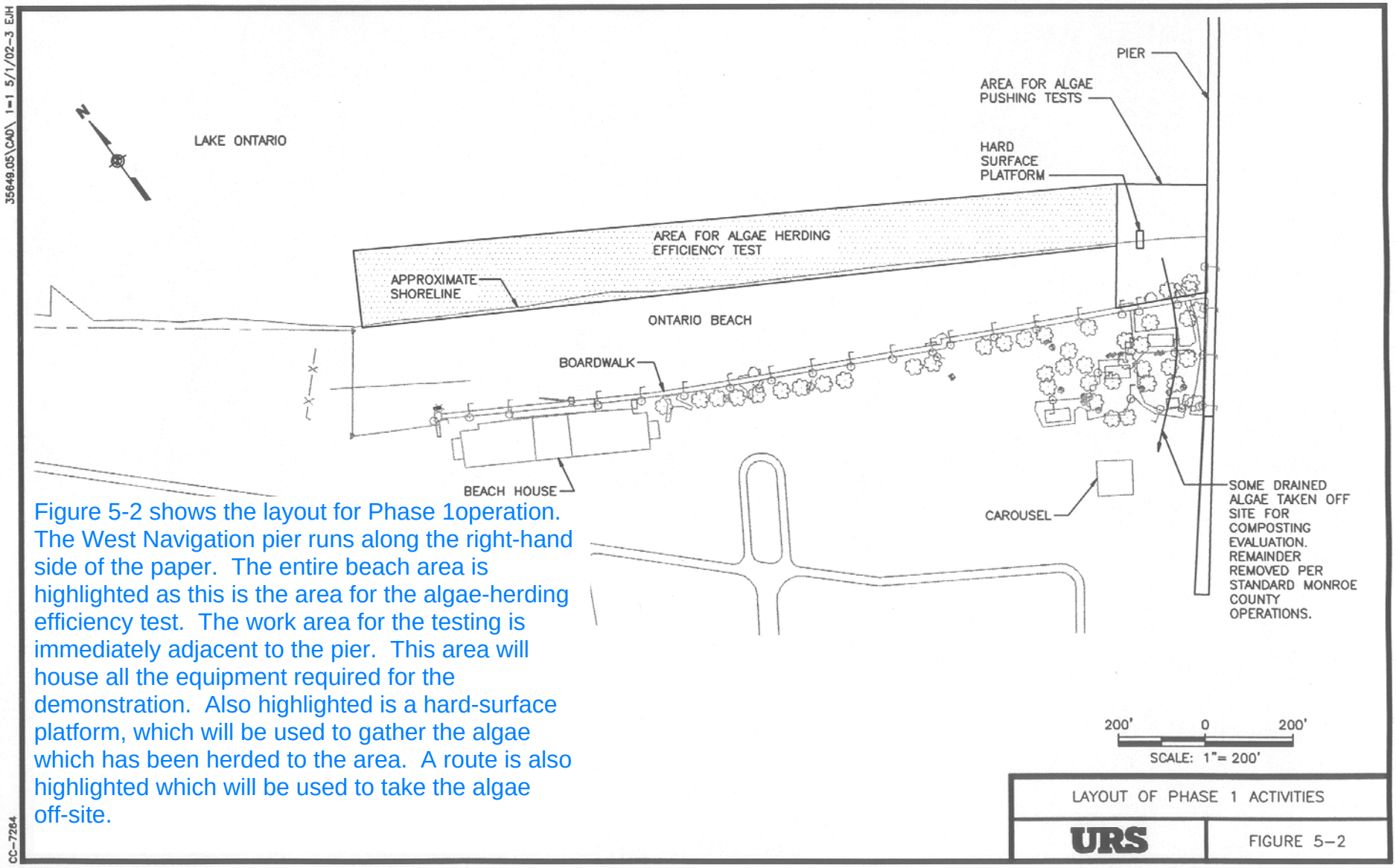


Figure 5-2 shows the layout for Phase 1operation. The West Navigation pier runs along the right-hand side of the paper. The entire beach area is highlighted as this is the area for the algae-herding efficiency test. The work area for the testing is immediately adjacent to the pier. This area will house all the equipment required for the demonstration. Also highlighted is a hard-surface platform, which will be used to gather the algae which has been herded to the area. A route is also highlighted which will be used to take the algae off-site.

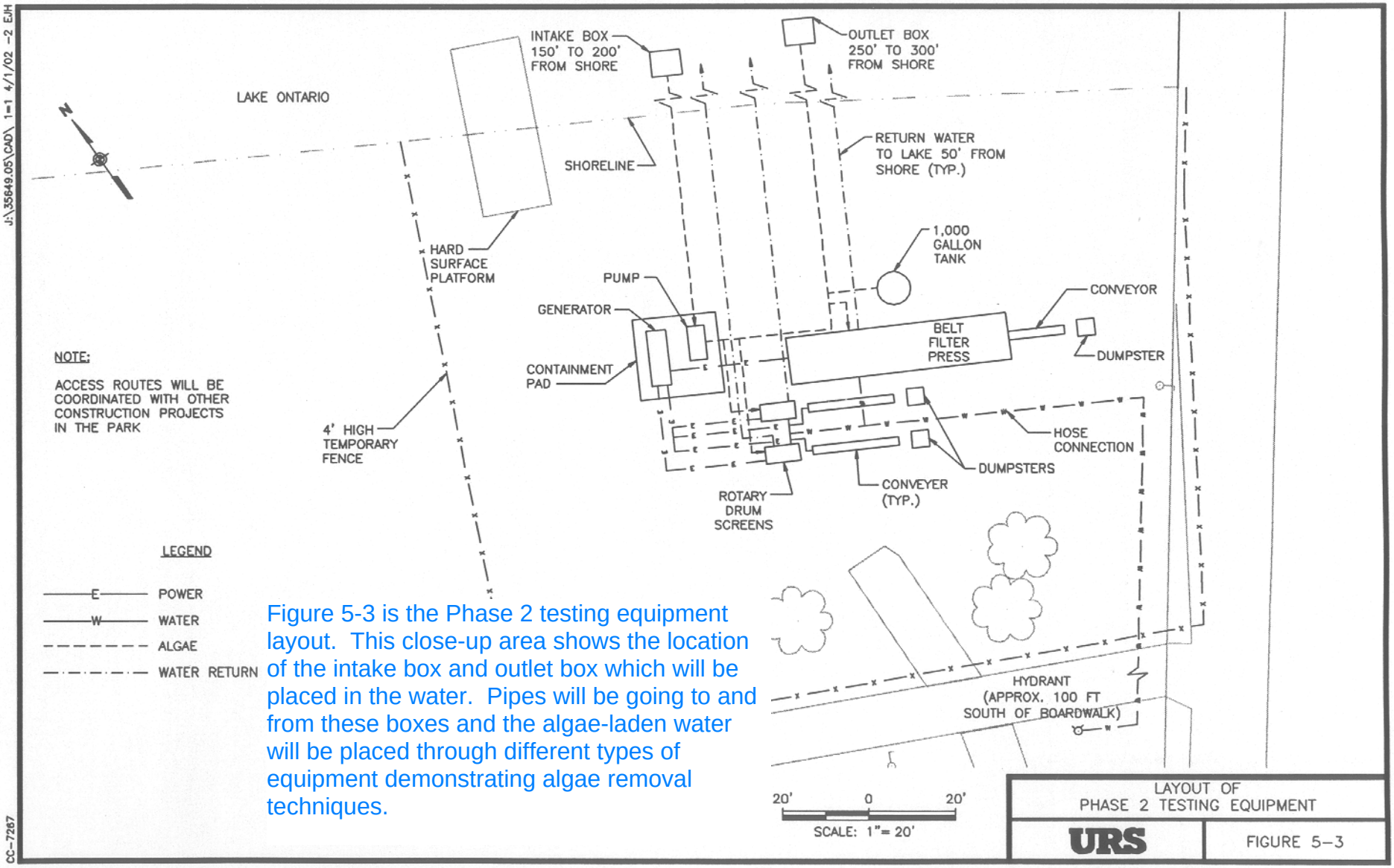
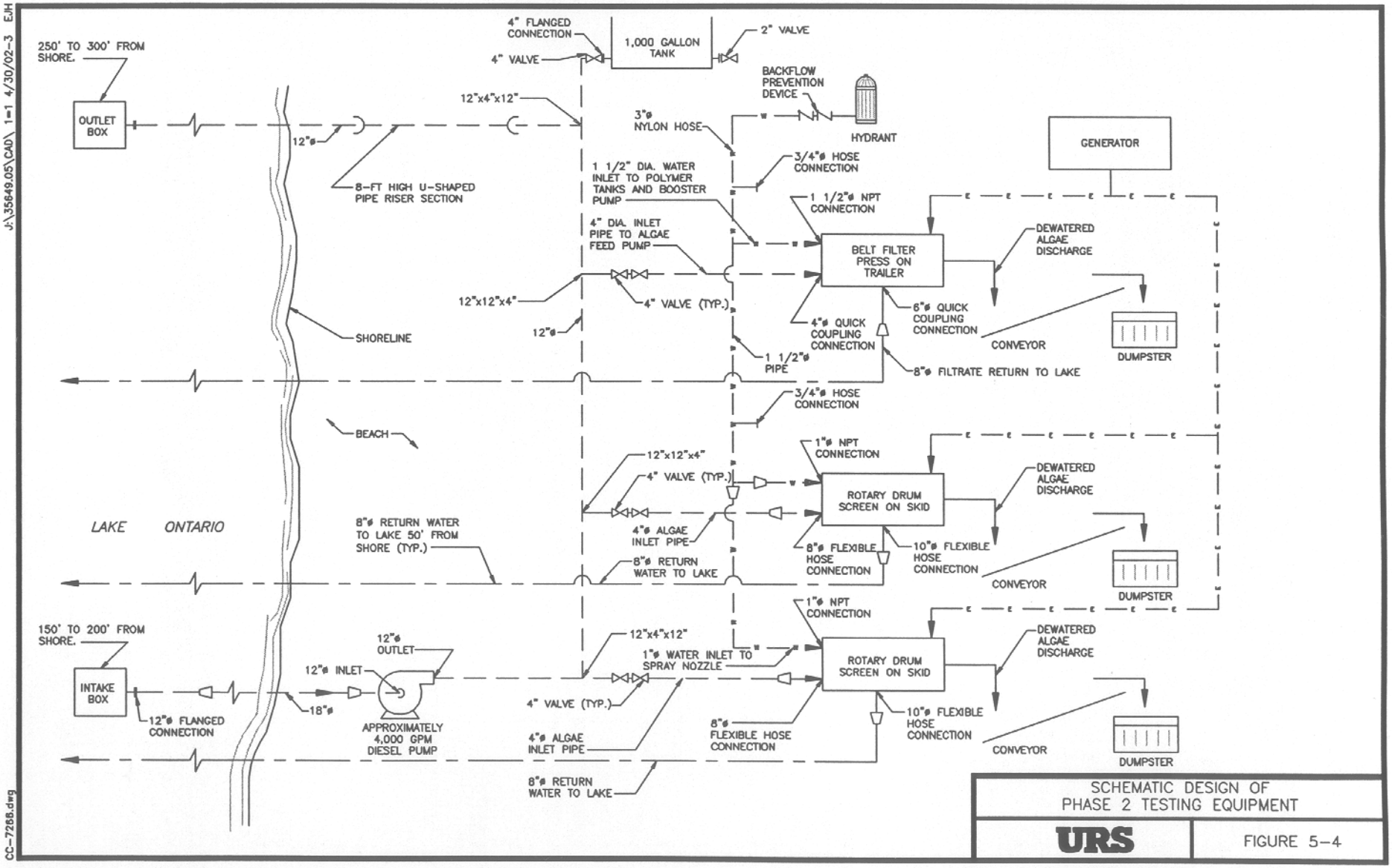


Figure 5-3 is the Phase 2 testing equipment layout. This close-up area shows the location of the intake box and outlet box which will be placed in the water. Pipes will be going to and from these boxes and the algae-laden water will be placed through different types of equipment demonstrating algae removal techniques.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250' TO 300' FROM SHORE.
OUTLET BOX
12"ø
8-FT HIGH U-SHAPED PIPE RISER SECTION
SHORELINE
BEACH
LAKE ONTARIO
8"ø RETURN WATER TO LAKE 50' FROM SHORE (TYP.)
150' TO 200' FROM SHORE.
INTAKE BOX
12"ø FLANGED CONNECTION
18"ø
12"ø INLET
12"ø OUTLET
APPROXIMATELY 4,000 GPM DIESEL PUMP
4" FLANGED CONNECTION
4" VALVE
1,000 GALLON TANK
2" VALVE
BACKFLOW PREVENTION DEVICE
HYDRANT
12"x4"x12"
3"ø NYLON HOSE
3/4"ø HOSE CONNECTION
1 1/2" DIA. WATER INLET TO POLYMER TANKS AND BOOSTER PUMP
4" DIA. INLET PIPE TO ALGAE FEED PUMP
12"x12"x4"
4" VALVE (TYP.)
12"ø
1 1/2"ø PIPE
GENERATOR
1 1/2"ø NPT CONNECTION
BELT FILTER PRESS ON TRAILER
DEWATERED ALGAE DISCHARGE
6"ø QUICK COUPLING CONNECTION
4"ø QUICK COUPLING CONNECTION
CONVEYOR
DUMPSTER
8"ø FILTRATE RETURN TO LAKE
3/4"ø HOSE CONNECTION
1"ø NPT CONNECTION
12"x12"x4"
4" VALVE (TYP.)
ROTARY DRUM SCREEN ON SKID
DEWATERED ALGAE DISCHARGE
4"ø ALGAE INLET PIPE
8"ø FLEXIBLE HOSE CONNECTION
10"ø FLEXIBLE HOSE CONNECTION
8"ø RETURN WATER TO LAKE
CONVEYOR
DUMPSTER
1"ø NPT CONNECTION
12"x4"x12"
1"ø WATER INLET TO SPRAY NOZZLE
ROTARY DRUM SCREEN ON SKID
DEWATERED ALGAE DISCHARGE
4" VALVE (TYP.)
4"ø ALGAE INLET PIPE
8"ø FLEXIBLE HOSE CONNECTION
10"ø FLEXIBLE HOSE CONNECTION
CONVEYOR
DUMPSTER
8"ø RETURN WATER TO LAKE
SCHEMATIC DESIGN OF PHASE 2 TESTING EQUIPMENT
URS
FIGURE 5-4

Facility. The remaining algae will be removed from the site by Monroe County personnel according to current procedures.

Table 5-1 presents the responsibility matrix for the 2002 Demonstration. This matrix shows how the completion of each work task will be coordinated and key organizational responsibilities. In terms of managing execution of the demonstration, URS will report to the USACE, and Monroe County will be the non-federal project sponsor. URS will coordinate directly with Monroe County on day-to-day operation during the demonstration.

TABLE 5-1
2002 DEMONSTRATION RESPONSIBILITY MATRIX

DEMONSTRATION WORK ITEM	URS CORPORATION	MONROE COUNTY	USACE
Section 4.0 – Constraints			
Coordination with Fast-Ferry Construction Project	XXX	XXX	XXX
Select Equipment Storage Site		XXX	
Public Notification			XXX
Chemical Storage	XXX	XXX	
Police/Fire Dept. Notification		XXX	
Regulatory Agency Notification			XXX
Beach Use Coordination	XXX	XXX	
Section 6.0 – Algae Monitoring			
Monitoring Setup	XXX	XXX	
Sample Collection and Field Measurements	XXX		
Sample Analysis (non composting)		XXX	
Composting Sample Analysis	XXX	XXX	
Bottles for EHL Analyses		XXX	
Bottles for URS Analyses	XXX		
Section 7.0 – Algae Herding			
Herding Equipment Rental		XXX	
Payment for Herding Equipment Rental	XXX		
Barber Surf Rake Purchase	XXX		
Herding Equipment Operation		XXX	
Test Supervision/Coordination	XXX		
Data Collection	XXX		
Videotaping/Photographs	XXX		
Interviews	XXX	XXX	
EHL Beach Monitoring		XXX	
Section 8.0 – Algae Pumping			
Pump Equipment Rental	XXX		
Construct Pumping System	XXX		
Tractor Rental		XXX	
Payment for Tractor Rental	XXX		
Tractor Operation		XXX	
Test Supervision/Operation	XXX		
Data Collection	XXX		
Videotaping/Photographs	XXX		
Pump Fuel	XXX		
Section 9.0 – Algae Pushing to Shore			
Pushing Equipment Rental		XXX	
Payment for Pushing Equipment Rental	XXX		

TABLE 5-1 (Continued)

DEMONSTRATION WORK ITEM	URS CORPORATION	MONROE COUNTY	USACE
Barber Surf Rake Purchase	XXX		
Pushing Equipment Operation		XXX	
Hard-Surface Platform Design and Purchase	XXX		
Hard-Surface Platform Installation	XXX	XXX	
Design/Fabricate Algae Collection Screen	XXX		
Test Supervision/Coordination	XXX		
Data Collection	XXX		
Videotaping/Photographs	XXX		
Interviews	XXX	XXX	
EHL Beach Monitoring		XXX	
Section 10.0 – Algae Screening			
Bench-Scale Testing	XXX		
Equipment Rental	XXX		
Test Supervision/Coordination	XXX		
WWTP Operator		XXX	
Data Collection	XXX		
Videotaping/Photographs	XXX		
Sample Analysis		XXX	
Section 11.0 – Algae Dewatering			
Bench-Scale Testing	XXX		
Equipment Rental	XXX		
Test Supervision/Coordination	XXX		
WWTP Operator		XXX	
Data Collection	XXX		
Videotaping/Photographs	XXX		
Sample Analysis		XXX	
Section 12.0 – On-Site Composting			
Coordination with Town of Greece	XXX		
Compost Bed Design	XXX		
Compost Bed Construction	XXX	XXX	
Compost Equipment/Operation		XXX	
Windrow Measurements	XXX		
Sample Analysis	XXX	XXX	
Section 13.0 – Plume Delineation Modeling			
Data Collection	XXX		
Sample Analysis	XXX		
Model Preparation and Analysis	XXX		
Boat Rental	XXX		
Section 14.0 – Other Demonstration Elements			
Develop Contact List	XXX		
Public Relations Plan		XXX	XXX
Accident Prevention Plan	XXX		

TABLE 5-1 (Continued)

DEMONSTRATION WORK ITEM	URS CORPORATION	MONROE COUNTY	USACE
Site Security	XXX		
Diesel-Powered Generator	XXX		
Generator Fuel	XXX		
Potable Water Supply	XXX	XXX	
110-volt Power Source		XXX	
Miscellaneous Equipment	XXX		
Data Compilation	XXX		

6.0 ALGAE AND RELATED ENVIRONMENTAL MEASUREMENTS

6.1 Objective

The overall objective of this task is to characterize algae and related environmental parameters in sufficient detail to permit an evaluation of alternative algae collection, handling and disposal options during the Summer 2002 demonstration program. The characterization includes the following:

- *Ontario Beach Measurements* – This refers to the measurements of algae accumulating in the nearshore zone along Ontario Beach prior to herding operations by the MCPD. These "in-place" algae characteristics and related parameters (e.g., turbidity) are an important benchmark for the evaluation of alternative herding, collection and disposal options.

- *Pumped Algae Measurements* – Algae pumping is a component of several alternatives (e.g., pumping to the Genesee River and pumping to a screen/dewatering system prior to land disposal). The characteristics of algae after discharge from a pump may be significantly different than those of in-place algae, and are the starting point for the evaluation of algae transport in the Genesee River / Lake Ontario, or handling and disposal of algae on land, after pumping.

- *Compost Facility Measurements* – There are a number of physical, chemical and biological characteristics of algae, as received at an offsite composting facility, that affect the feasibility of the composting alternative.

- *Genesee River and Lake Ontario Measurements* – Algae discharged into the Genesee River or Lake Ontario could potentially have adverse impacts upon either or both water bodies. In order to evaluate these potential impacts, algae and receiving water characteristics are needed for use in hydrodynamic and water quality models.

Table 6-1 summarizes the measurements of algae and related environmental parameters proposed during the Summer 2002 demonstration program. The following sections explain these measurements in greater detail and provide a rationale for them. Note that the measurements indicated in Table 6-1 do not include the operating tests required for the algae screening test (Section 10.0) and algae dewatering test (Section 11.0).

TABLE 6-1
SUMMARY OF ALGAE AND RELATED ENVIRONMENTAL MEASUREMENTS

Parameter	Test Method (1)	No. Sampling Days	No. Samples per Day	Total No. Samples	Comments
Ontario Beach Measurements					
Density: fluid	(2)	10	4	40	Sample on 5 days during Phase 1 of Demonstration Program and 5 days of Phase 2. Collect samples in morning, prior to herding operations, at each of 4 locations sampled by Monroe County Environmental Health Laboratory (EHL).
Density: 1-hr drained	(3)	10	4	40	
Moisture Content: 1-hr drained	(3)	10	4	40	
Density: 48-hr drained	(4)	10	4	40	
Moisture Content: 48-hr drained	(4)	10	4	40	
Total Solids Dried at 103-105 deg C	SM 2540 B	10	4	40	
Fixed and Volatile Solids Ignited at 500 deg C	SM 2540 E	10	4	40	
Dissolved O_2	SM 4500-O	10	4	40	
BOD_5	SM 5210 B	10	4	40	
Algae Identification	SM 10900 C	10	4	40	
Turbidity	SM 2130 B	15	8	100	Same as above, but collect samples before & after herding, and sample 10 days in Phase 1.
Fecal Coliform	SM 9222 D	15	8	100	
Pumped Algae Measurements					
Density: fluid	(2)	5	1	5	Sample on 5 days during Phase 2 of Demonstration Program. Collect samples from temporary storage tank, which receives water discharging from pump at east end of Ontario Beach.
Particulate Floatables	SM 2530 B	5	1	5	
Total Solids Dried at 103-105 deg C	SM 2540 B	5	1	5	
Fixed and Volatile Solids Ignited at 500 deg C	SM 2540 E	5	1	5	
Dissolved O_2	SM 4500-O	5	1	5	
BOD_5	SM 5210 B	5	1	5	
Turbidity	SM 2130 B	5	1	5	
Fecal Coliform	SM 9222 D	5	1	5	

TABLE 6-1 (Continued)

Parameter	Test Method (1)	No. Sampling Days	No. Samples per Day	Total No. Samples	Comments
Algae Settling Velocity	(5)	2	1	2	Perform column settling tests at SUNYAB for water quality (algae) modeling study.
Compost Facility Measurements					
Pre-Compost Phase					
Fecal Coliform	SW 9222 D	2	4	8	Note 6
Enterococcus	SM 9230 B or C	2	4	8	Note 6
Total Metal Analysis	SW 60108 B/7471A	1	4	4	
Fats, Oils, Greases	SW 9071 A	1	4	4	
Salmonella	SM 9260 D	2	4	8	Note 6
Botulism		2	4	8	Note 6
Pesticides	SW 8081 A	1	4	4	
Herbicides	SW 8151 A	1	4	4	
PCBs	SW 8082	1	4	4	
PCP	SW 8041	1	4	4	
Composting Phase					
pH	Field Test	12	4	48	pH Meter by URS
Temperature	Field Test	12	4	48	Thermometer by URS
Oxygen	Field Test	12	4	48	Oxygen Meter by URS
Moisture Content	ASTM D2216-92	3	4	12	
Carbon/Nitrogen Ratio	EPA 440.0	3	4	12	
Post Composting Phase					
Nitrogen (NO3)	EPA 352.1	1	4	4	
Nitrogen (NH4)	EPA 350.2	1	4	4	
Phosphorus (P)	EPA 365.3	1	4	4	
Potassium (K)	SW 6010 B	1	4	4	
Calcium (Ca)	SW 6010 B	1	4	4	
Magnesium (Mg)	SW 6010 B	1	4	4	
Genesee River and Lake Ontario Measurements					
Dissolved O_2	SM 4500-O	2	10	20	On each of two separate days during the collection of current measurements for validation of the hydrodynamic model, collect 10 water samples for use in the water quality (algae) model, including 5 from Genesee River and 5 from along the plume axis in Lake Ontario.
BOD_5	SM 5210 B	1	5	5	
Total Suspended Solids	SM 2540 D	2	10	20	
Conductivity	SM 2510 B	2	10	20	
Total Organic Carbon	SM 5310 B	2	10	20	

Notes:

1. Unless otherwise noted, test methods refer to: SM = *"Standard Methods for the Examination of Water and Wastewater,"* American Public Health Association, American Water Works Association, and Water Environment Federation, most recent edition. SW = *"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Final Update III,"* USEPA, June 1997. EPA = "*Methods for Chemical Analysis of Water and Wastes,"* EPA 600-4-79-020, Revised March 1983 (for NO_3, NH_4 and P). EPA = *"Methods for the Determination of Chemical Substances in Marine and Estuarine Matrices – 2nd Edition,"* EPA 600/R-97-072, September 1997.

2. Collect two algae-laden water samples in place using 2-liter jars; weigh the contents of the jars; and calculate fluid density in milligrams per liter (mg/L).

3. Empty contents of one 2-liter jar onto a screen, allow to drain in open air onsite for 1 hour, then weigh accumulated algae/debris accumulated on the screen and calculate "1-hour drained density" of algae in mg/L. Immediately after weighing, collect a subsample of drained algae and perform laboratory analysis of moisture content using ASTM Method D2216-92, "*Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock."*

4. Empty contents of second 2-liter jar onto a screen, allow to drain in open air onsite for 48 hours, then weigh accumulated algae/debris accumulated on the screen and calculate "48-hour drained density" of algae in mg/L. Immediately after weighing, collect a subsample of drained algae and perform laboratory analysis of moisture content using ASTM Method D2216-92.

5. Perform column settling tests on two pumped algae samples to determine representative settling velocities for use in water quality (algae) model.

6. Perform one test during Pre-Composting and perform the second test on the finished compost (Post-Compost Phase) product to ascertain whether these parameters survive the curing process.

6.2 Ontario Beach Measurements

The characteristics of algae-laden water accumulating at Ontario Beach vary significantly during the course of a summer season. This variation is the result of many factors, including meteorological conditions, currents, algae type and state of algae decay. (The algae at Ontario Beach is not resident to the study area, but rather carried in from other locations.) In order to evaluate the range of algae characteristics, sampling from the beach area will be performed on 10 separate days: five during the first month of the demonstration project (Phase 1) and five during the second month (Phase 2). (See Section 5.0 for a schedule of demonstration project activities.) On each day, samples will be collected prior to MCPD maintenance (algae herding) operations at each of the four separate beach sections monitored by the Monroe County Environmental Health Laboratory (EHL). The samples will be collected at the approximate locations where the EHL sampling technician estimates in-place algae "density" on a daily basis. This will allow the establishment of a correlation between the daily algae density/volume estimated by EHL, and

actual measured algae density/volume. The following parameters will be measured for each sample:

Density (fluid, 1-hour drained, 48-hour drained) – As described above, algae density measurements will be used to evaluate the mass and volume of algae accumulating at Ontario Beach during different summer conditions, and to establish a correlation between these measured values and the daily EHL estimates of algae density/volume. Two jar samples (2-liter jars) of algae-laden water will be collected at each sampling station. The jar samples will be weighed initially to determine the fluid density (i.e., the density of the algae-laden water accumulating at the beach.) Each jar sample will then be emptied onto a separate screen, where the algae/solid mixture will be allowed to drain for 1 hour and 48 hours, respectively. (This is intended to simulate the natural draining process of algae that is presently pushed up onto the beach, allowed to drain for a short period of time, then loaded into dump trucks for offsite disposal.) A tarp or tent will be used to protect the drying algae from precipitation during moderate storm events. The algae/solid mass on the screens will be weighed after the respective draining periods, and the 1-hour and 48-hour "drained density" of the in-place algae will be determined. These will be used to estimate the mass and weight of algae that must be handled under various conditions.

Moisture Content (1-hour drained, 48-hour drained) – The moisture content of drained algae is important for evaluating the feasibility of offsite composting. Therefore, immediately after weighing the 1-hour and 48-hour drained density samples (above), a subsample of each will be collected and tested for moisture content.

Total Solids Dried at 103-105°C – The total solids content of a sample includes both organic and inorganic fractions. It is useful for characterization purposes as an indicator of the total dry weight/density of algae/solids present in the nearshore water at Ontario Beach. Also, in combination with the test for fixed and volatile solids (below), it is useful as an indicator of the percent of total dry weight that occurs in organic form (expected to be very high).

Fixed and Volatile Solids Ignited at 500° C – Ignition removes volatile/organic material from the sample. The results, in combination with the results from "Total Solids Dried at 103-105° C," will allow an approximation of the organic content of algae-laden water samples from

Ontario Beach. The organic content is directly related to oxygen depletion and other negative environmental impacts associated with algae accumulation.

Dissolved Oxygen and Biochemical Oxygen Demand – Dissolved oxygen (DO) and 5-Day Biochemical Oxygen Demand (BOD_5) are two important parameters that are directly related to the occurrence of algae in the study area, and indicative of its negative impacts upon water quality and ecological habitat. Their values are also important for modeling the impacts of algae discharge into the Genesee River or Lake Ontario.

Algae Identification – Historically, the two primary types of algae occurring at Ontario Beach have been *Cladophora* and *Spirogyra*. The two have distinctly different characteristics from a collection and handling standpoint, and in the past each has occurred at different times during the summer as the predominant algae type in the study area.

Turbidity and Fecal Coliform – These parameters are closely correlated with algae occurrence, and also serve as key criteria in the beach closure model used by Monroe County. For this reason, and as a quantitative criterion for the evaluation of algae herding effectiveness, they will be measured on each of the sampling days both before and after beach maintenance operations by the MCPD. Also, unlike the other parameters discussed above, turbidity and fecal coliform will be measured on 10 days during Phase 1, since the effectiveness of modified algae herding operations will be determined during the first phase.

6.3 Pumped Algae Measurements

During Phase 2 of the demonstration project, algae-laden water will be pumped from the east end of Ontario Beach to test the effectiveness of algae screening and dewatering, and also to evaluate the operation of a pump system passing large quantities and high concentrations of algae. The pumping process will tend to shred the algae, and probably homogenize the algae/water mixture to a certain degree. The characteristics of this mixture are important, since it represents the "input" to a screen / filter press, as well as the inflow to the Genesee River / Lake Ontario under Alternative 11 of the Feasibility Study (Pumping with Modified Maintenance Operations). Like "in-place" algae at Ontario Beach, it is anticipated that the characteristics of pumped algae may vary considerably during the course of the demonstration project. Therefore,

pumped algae will be characterized on five separate days, corresponding to the same days (during Phase 2) that in-place algae characteristics are measured at the beach (Section 6.2).

During Phase 2, a 1,000-gallon polyethylene tank will be provided in the work area on the east end of the beach. This tank will be filled on sampling days using a shunt line from the pumping system (Section 8.0), and used to collect samples. It will also be used to visually observe the settling characteristics of pumped algae/water mixture under quiescent conditions. Samples from the tank will be collected from the tank immediately after it has been filled. These samples will be analyzed for the same parameters as the Ontario Beach samples (Section 6.2), with the following exceptions:

Density and Moisture Content – On a full-scale basis, pumped algae would be either discharged to the Genesee River / Lake Ontario, or else passed through a screen assembly or filter press. It would not be allowed to drain on the ground surface, as is presently the case for algae pushed onto the shore by the MCPD. Therefore, drained algae measurements of density and moisture content will not be performed for pumped algae. However, density and moisture content will be measured for algae passing through the pilot-scale screen assembly (Section 10.0) and coming off the belt filter press (Section 11.0).

Algae Identification – Because of the disturbance caused by the pump impellers, this test will not be performed on pumped samples.

Particulate Floatables – Floatable material in the discharged algae/water mixture is important for evaluating potential impacts on the Genesee River and Lake Ontario under Alternative 11. Floatables can accumulate on the surface, are often highly visible, are subject to wind-induced transport, and may contain pathogenic bacteria.

Algae Settling Velocity – In addition to general observations regarding algae settling within the 1,000-gallon tank, a sample from the tank will be collected and a column settling test will be performed using equipment at the State University of New York at Buffalo Civil and Environmental Engineering Department. The resulting settling velocity will be used in the water quality model to evaluate the impacts of discharged algae on the Genesee River, Lake Ontario and downstream landowners.

6.4 Compost Facility Measurements

The feasibility of composting depends upon a number of physical, chemical and biological properties of algae. Some of these will be obtained by measurements taken from in-place and pumped algae (e.g., moisture content), as described in previous sections. The chemical characteristics of algae will be determined by sampling material delivered to the offsite pilot composting facility. Chemical characterization is necessary to identify algae constituents that may affect composting feasibility from technical (process) and regulatory standpoints (e.g., pathogens), and also to evaluate parameters that directly influence composting operations (e.g., nutrient levels). On two separate days, a sample will be collected of algae delivered to the offsite pilot testing facility, and analyzed for the following parameters:

Fecal Coliform and Enterococcus – These analyses will be performed to test for potentially harmful bacteria associated with algae. They will be run on the four compost windrows at the beginning of the compost curing process to determine the presence of these bacteria. Because heat and moisture play a significant part in the curing process and can keep bacteria alive, the tests will also be run at the completion of the curing process to determine the presence and amount of bacterial contamination. If microbial results exceed those set under New York State Environmental Conservation Law (ECL) for sludge composting, the algae will be disposed of by landfilling.

Total Metal Analysis – Uptake or absorption of metals through the algae/seaweed growth process is possible. If present in high enough concentrations in algae, metals could inhibit biological processes and/or preclude the beneficial end use of composted algae. Therefore, heavy metals will be tested for once on the drained, screened and dewatered algae used for stand-alone composting, and once on the drained algae used for co-composting (total of four samples, one for each windrow.)

Fats, Oils, & Greases (FOG) – This parameter indicates the presence of combined organics and petroleum. High FOG concentrations can drastically inhibit the microbial activity that produces anaerobic and aerobic decomposition in the composting process. One analysis will be performed on algae destined for each of the four offsite windrows.

Pathogenic Organisms – Salmonella and Botulism are two pathogens known to cause fish and waterfowl kills in the Great Lakes, usually during the summer months. They may be associated with algae. If pathogens survive the compost curing process, added treatment may be required or a decision may be made to not make the compost available for beneficial use(s).

Pesticides and Herbicides – These organics are usually tested in yard waste composting because they are often used in lawn and garden treatments. Along the Lake Ontario shoreline, agriculture is predominant and pesticides and herbicides are commonly used. Algae may possibly harbor some of these pesticides and herbicides from over-spraying of fruit trees and crops, and from surface runoff. High concentrations of pesticides and herbicides would make composting unfeasible. Therefore, one sample will be collected from algae prior to composting in each of the four windrows and, if concentrations exceed ECL standards for yard waste compost, the material will be landfilled instead.

Polychlorinated Biphenyls (PCBs) and Pentachlorophenol (PCP) – PCBs and PCP are hazardous contaminants frequently found in New York water bodies. They will be analyzed for in algae samples going to each of the four windrows, and their concentrations will be compared with those allowable under the State ECL.

Temperature, Oxygen and pH – These three properties are used to determine microbial activity and conditions for successful curing. They will be monitored in the field on a monthly basis for up to 12 months.

Temperature is a key indicator of microbial activity, with a range of 35ºC to 60ºC considered acceptable. Temperatures below or above this range affect the metabolic rate of organisms, decrease microbial activity, and may cause anaerobic conditions. Additionally, pathogens are not able to survive in temperatures within these temperature ranges.

Oxygen is required for inducing aerobic digestion, maintaining microbial activity and reducing odors. Insufficient oxygen is an indicator of potential anaerobic conditions, which can be rectified by more frequent turning of the compost windrows.

pH is another indicator of microbial activity. Optimum pH levels for composting range from 6.0 to 7.5. Monthly field measurements will indicate if turning is required or bulking agents need to be added.

Moisture Content – Moisture content of compost should range between 30 and 50 percent for effective microbial activity. Moisture content will be tested three times during the compost curing process. The test will be performed at the beginning, midway, and at the end of the curing process on each of the four windrows. Additionally, during monthly inspections, the inspector will check for moisture by simply hand grabbing a sample and squeezing it into a clump. If the sample remains in a clump without water dripping, moisture content can be assumed to be within range. If the sample is dripping, or appears dry and does not form into a clump, additives or bulking agents may need to be added.

Carbon/Nitrogen Ratio – This test is important for evaluating the biomass and microbial activity in the algae compost. Ratios falling between 30 and 70 are considered acceptable. This test will, along with changes in pH, oxygen content, temperature and moisture content, indicate whether more frequent turning is required or bulking agents are needed to increase aerobic digestion. The test will be run at the same frequency as moisture content.

Compost Nutrients – At the completion of the compost curing process, the windrows will be tested for nutrient composition. The analysis will cover those nutrients normally found in fertilizers used for gardening and lawn care. These are Nitrogen (NO3 & NH4), Phosphorus (P), Potassium (K), Calcium (Ca), and Magnesium (Mg). The concentration of these nutrients in the compost will indicate the quality of the compost product for beneficial use(s).

6.5 Genesee River and Lake Ontario Measurements

A plume delineation model will be used to evaluate the potential impacts of pumping algae-laden water into the Genesee River or into Lake Ontario at the end of the west pier. As discussed in Section 13.0, the plume delineation model includes a hydrodynamic model for predicting current flow and water movement under various wind and river flow conditions. It also includes a water quality model, coupled with the mass transport model, for evaluating the fate and transport of algae moving within the current field. In order to calibrate and verify the

hydrodynamic model, current measurements will be taken by boat within the Genesee River channel and Lake Ontario on two occasions. At the same time, water quality parameters will be measured for use in the algae transport model. Water quality samples will be collected at 10 locations: four along the Genesee River channel from upstream of the proposed discharge location to the end of the pier and six within Lake Ontario along the approximate axis of the naturally occurring Genesee River plume. The samples will be analyzed for the following parameters:

Dissolved Oxygen and Biochemical Oxygen Demand – If algae were discharged into the Genesee River, as per Alternative 11, its environmental impact would be expressed most clearly in terms of potential dissolved oxygen reduction and oxygen demand. Therefore, in order to evaluate the impacts of this discharge by modeling, it is important to understand the value of these parameters under existing (pre-pumping) conditions. Each of the 20 water quality samples (10 locations, 2 dates) will be analyzed for DO. In addition, five of the samples will be analyzed for BOD_5. (BOD_5 is a more difficult analysis, and BOD_5 measurements in the River and Lake are typically very low or non-detected. Therefore, only five BOD_5 analyses will be performed, and a correlation will be established between total organic carbon (see below) and BOD_5.)

Total Suspended Solids and Conductivity – The total suspended solids (TSS) content and conductivity of water in the Genesee River are, under normal conditions, expected to be higher than those in Lake Ontario. Therefore, under existing conditions, TSS and conductivity represent natural "tracers" that may be useful for the development and calibration of the water quality model.

Total Organic Carbon – Like TSS and conductivity, the total organic carbon (TOC) content of water within the Genesee River may be significantly different than that of the open water in Lake Ontario. Therefore, TOC may also serve as a useful parameter for development and calibration of the water quality model.

6.6 Equipment and Operational Requirements

The measurements described in this section will be performed by URS personnel, who will also provide all necessary sampling equipment and supplies. The Monroe County EHL will

be responsible for the analysis of all samples requiring offsite analytical analysis (see Table 6-1), except for salmonella, botulism, pesticides, herbicides, PCB's and PCP. The EHL will provide sample jars and containers for these tests. URS personnel will provide sample jars, containers and related equipment for all other measurements, including:

- 2-liter sample jars, screen drains, and a scale for the measurement of density (fluid, 1-hour drained, 48-hour drained)
- Sample containers for moisture content tests
- A 1,000-gallon polyethylene tank for the collection of fluid for pumped algae measurements
- Sample containers for the collection of a settling column test, to be performed at the State University of New York at Buffalo
- A boat for the collection of water quality samples from the Genesee River and Lake Ontario (at the same time as current measurements for hydrodynamic model calibration)

6.7 Implementation and Coordination Issues

Because the Monroe County EHL will supply sample jars and perform the analyses for Standard Methods tests, it will be necessary for URS sampling personnel to coordinate closely with EHL personnel during sampling events. The level of coordination and methods for achieving it should be very similar to those implemented during the August 2001 demonstration project, when EHL and URS performed similar roles.

7.0 ALGAE HERDING EFFICIENCY

7.1 Objectives

Efficient algae herding is an important component of all viable alternatives at Ontario Beach. The objective of this task is to evaluate alternative algae herding options, and to identify option(s) that improve the efficiency of MCPD's current herding operations. Improving efficiency has been defined as the ability to achieve one or more of the following: 1) reducing the time required to clear the water of algae on a given day without washing algae into the swimming area (on lighter algae days), 2) increasing the volume of algae herded towards the west pier in a specific time period (on heavier algae days), and 3) expanding the area that algae herding can be effectively performed.

Previous algae herding demonstrations were performed in the summers of 2000 and 2001. The results of these demonstrations are summarized in Appendix D of the Feasibility Study (FS). Based on the results of these efforts, the following evaluations are included in this work task:

- Determine if larger equipment can be used to improve herding efficiency with respect to existing practices.

- Evaluate the improvement in algae herding by using two equipment operators instead of the existing single operator.

- Determine if the use of a 12-foot snow pusher would further enhance algae herding efficiency.

- Evaluate the effectiveness of using a second tine machine to improve algae removal with respect to the existing York Rake.

- Evaluate if larger herding equipment would result in pushing more algae into the swimming area.

7.2 Equipment Requirements

The following equipment is required for this pilot test.

- Equipment currently used by Monroe County to herd algae:

  - Case 570XLT tractor with 1-cubic yard (cy) clamshell bucket
  - New Holland TS110 tractor with a 1-cy bucket
  - Barber 600-HD surf rake (tine machine)
  - York Rake

- Equipment requiring purchase:

  - Barber 600-HD surf rake (tine machine). The manufacturer of the surf rake does not lease units. Therefore, a new unit will be purchased to permit the evaluation of a second tine machine.

- Equipment that would be leased:

  - John Deere 644 tractor with 3-cy bucket with teeth and clamshell. A set of forks will be provided to allow the tractor to be used for assembling demonstration equipment (see Sections 8.0 through 11.0). As requested by Monroe County beach maintenance personnel.
  - Case loader with a 2-cy bucket w/teeth and clamshell, and a hand-throttle.
  - 12-foot Pro-Tech snow pusher

As with the Summer 2001 demonstration, Monroe County will lease the above-referenced equipment and pass the cost to URS for payment.

7.3 Work Task Mobilization/Demobilization

Monroe County owns much of the equipment required for this work task, which would be expected to be readily available for the demonstration. As noted above, a new Barber 600-HD surf rake will be purchased for the demonstration. Monroe County will retain the surf rake at the end of the demonstration to improve current beach maintenance practices.

The remaining equipment (e.g., John Deere tractor and snow pusher) will be leased for the full one-month period of Phase 1. The John Deere tractor with forklift and 3-cy bucket attachments will be leased for an additional month during Phase 2 to assist with installation of the equipment described in Sections 8.0, 10.0, 11.0 and 14.0. The machinery most likely will be leased from C.P. Ward, as this firm was used to furnish equipment for the 2001 demonstration and is familiar with Monroe County's purchasing procedures. C.P. Ward will be responsible for transporting the leased equipment to the park. Monroe County will provide the operators for the leased equipment.

Equipment currently owned by the County is stored by the park maintenance garage. Three possible locations for storing the leased equipment are: 1) at the east end of the beach, 2) at the park maintenance garage, and 3) in the boat launch parking area. The storage location will be determined by Monroe County.

7.4 Data Collection and Operation Plan

The algae herding equipment efficiency demonstration will be conducted between June 15th and July 15th. Algae herding will be demonstrated each day regardless of the quantity of algae; this will allow the operators to become familiar with the proposed equipment and practice simultaneously operating two pieces of equipment in the water to optimize algae pushing.

Algae herding testing will typically be performed between 6:00 a.m. and 9:30 a.m. to coincide with available daylight hours before the beach opens to the public. As previously noted, Monroe County personnel will conduct pushing tests past 9:30 a.m. on heavy algae days when the beach is closed. The algae herding demonstration will consist of a series of full-scale tests with a different configuration of existing and proposed equipment tested each day. The full-scale tests

will substitute for current herding operations. This will allow equipment operator(s) normally assigned to herding operations to be used for the test without impacting the County's ability to clear algae from the beach. If, during performance of a test, the herding equipment configuration is found to be less effective than using existing equipment, the test for that day will be stopped in order to allow County personnel to herd the algae using existing equipment.

One or two Monroe County equipment operators will be required, as test requirements dictate. In general, existing and proposed equipment will be tested using the existing herding technique of developing a wave using the tractor bucket to push the algae towards the west pier. Adjustments will be made as necessary to the herding technique based upon an initial performance of the proposed equipment. The same operators will be employed throughout the demonstration to allow for consistent operator input on performance of the different equipment configurations.

Twenty-one working days (not including weekends and holidays) are available in Phase 1. The first week of the demonstration will involve a screening of the following five general algae pushing equipment configurations:

- Day 1: Use of existing equipment with one operator to perform herding. The New Holland tractor with the tine machine will be tested.

- Day 2: Use of existing equipment with two operators to push algae. The New Holland tractor with the tine machine and the Case 570XLT tractor with the tine machine will be tested.

- Day 3: Use of proposed equipment with one operator. The John Deere 644 (no snow pusher).

- Day 4: Proposed equipment, including snow pusher, with one operator. The John Deere 644 (with snow pusher attached).

- Day 5: Proposed equipment with two operators. The John Deere 644 and the 2-cy Case tractor. The use of the snow pusher for this test will be determined based upon operator input.

Tests to be conducted on the remaining 16 days will be determined based on performance from the first five days. Determination of subsequent equipment configurations will be based on visual observations and operator input.

Data collection and analysis will involve a combination of analytical and visual parameters. A data entry form will be prepared daily, and forms will be compiled by URS on a weekly basis. The data table will be used to log daily test conditions and observations. Specific information will include:

- Date of test
- Time algae herding equipment are operating (hours)
- List of equipment tested
- Current weather
- Previous day's weather
- Wind speed and direction on current and previous days
- Direction of Genesee River discharge
- MCEHL estimate of algae volume and density determined daily as part of EHL's beach monitoring program
- Description of operation
- Maximum depth of operation for each piece of equipment
- Algae type as described daily by EHL as part of their beach monitoring program
- Beach status for the day (e.g., open or closed)
- URS representative's visual description of results
- Equipment operator's description of result

In addition to this log, the following measurements and information will be used to assist with evaluating algae herding equipment efficiency:

- Quantitative measurements of algae density and moisture content at each of the four separate beach sections prior to algae herding. Samples for these measurements will be collected and analyzed as part of the work described in Section 6.0. Sampling will be performed on five days during Phase 1 (using modified equipment) and five days during Phase 2 (using existing equipment). The purpose of these samples will be to establish a correlation between the daily algae density/volume estimated by EHL and actual measured algae/volume.

- Turbidity and fecal coliform measurements will be taken at each of the four beach sections before and after algae herding. Samples for these measurements will be collected and analyzed as part of the work described in Section 6.0. During Phase 1, samples will be collected on 10 different days. Samples will be collected on five different days during Phase 2. The turbidity measurements will be used to evaluate how different algae herding equipment configurations impact water clarity. Fecal coliform measurements will be used to evaluate how herding equipment modifications will affect bacteriological water quality.

- A videotape of algae herding operations will made on each of the 10 days during Phase 1 that turbidity and fecal coliform samples are collected. In addition, "before-and-after" photographs will be taken using a digital camera.

7.5 Evaluation Criteria

As presented in Section 7.4, evaluation of algae herding efficiency will be based on a combination of measurements and observations. The data will be evaluated to answer the following questions:

1. Has the proposed herding equipment reduced the amount of time required to clear the water of algae?

2. Do the proposed equipment and operations modifications result in increasing the amount of algae herded towards the west pier?

3. Can the existing area (e.g., based on depth of water) for herding algae be expanded further from the shore using the proposed equipment?

4. Does the algae herding equipment configuration improve water clarity (e.g., turbidity)?

5. Does the algae herding equipment configuration reduce fecal coliform levels in the study area?

6. Is one particular piece of equipment more suitable for a certain type and/or quantity of algae?

7. Will the proposed equipment configurations result in more algae being herded to the swimming area of the beach? (This would result in additional time to clean the algae off of the beach).

7.6 Implementation and Coordination Issues

The following implementation and coordination issues will be addressed during performance of the demonstration:

- The proposed herding equipment will also be needed for the hard-surface loading platform installation and the algae pushing to shore evaluation discussed in Section 9.0. Platform installation and the pushing to shore tests will be performed after the algae herding tests have been completed for the day (9:30 a.m.).

- Because algae herding is likely to be the most critical element of this demonstration, the herding tests will take precedence over algae pushing to shore tests on days of heavy algae when the beach is closed.

- Coordination with MCEHL personnel will be required for observation of herding tests. Input from the MCEHL representative will be used to evaluate whether the

proposed equipment would allow the beach to be opened on a day when it would otherwise be closed.

- The proposed equipment will also be used to assist with mobilizing the pilot-scale equipment scheduled for testing between July 15th and August 15th (Phase 2).

- An overnight storage site for the proposed equipment will need to be selected by Monroe County.

8.0 ALGAE PUMPING

8.1 Objectives

Algae pumping was demonstrated at Ontario Beach in August 2001. Empirical data showed that sufficient pumping can create an algae capture zone that could remove algae herded to the east end of the beach. Algae pumping could be used as an alternative to mechanically pushing algae to shore, or as a method for conveying algae-laden water to the Genesee River or Lake Ontario. The objective of the Summer 2002 demonstration is to evaluate the "pumpability" of algae for either purpose. During the demonstration, algae will be pumped to a screen system (Section 10.0) and to a belt filter press (Section 11.0) as part of the evaluation of these land-based handling methods.

In order to meet the objectives of the algae pumping work task, the following activities will be performed:

- Install a pumping system on the east end of the beach. Key differences from the 2001 demonstration will be that pumping flow rates will be smaller and that the west pier will not be closed.

- Evaluate the "pumpability" of algae under various algae loadings. Minimal algae were present during the 2001 demonstration. Therefore, evaluation of how the pumps handle algae-laden water was not possible. A particular concern for this demonstration is clogging of the intake, which would limit the evaluation of pumpability. While the intake for the 2001 demonstration was designed for receiving high flows in shallow water conditions, it may be subject for clogging under heavy algae conditions. Therefore, a new intake, designed to better resist clogging, will be fabricated.

- Provide sufficient water to simultaneously supply the two pilot-scale rotary drum screens and one belt filter press, and provide flow to a 1,000-gallon storage tank, to be used for the evaluation of settling velocity and other characteristics of pumped

algae, which are necessary for the evaluation of fate and transport of algae pumped into the Genesee River.

- Fabricate an outlet box to reduce sand erosion and impacts to the flow around the intake.

8.2 Equipment Requirements

The following equipment will be required for this task.

- Equipment owned by Monroe County
  - Tractors used for algae herding as required to assist with installation of the pumping equipment
  - Equipment operators to run the tractors
  - Floating markers for intake box, outlet box and piping (8)
  - Fuel for existing and leased tractors

- Equipment requiring purchase
  - Steel intake box
  - Steel anchor rods for intake and outlet pipe
  - Outlet box
  - 1,000-gallon polyethylene storage tank

- Equipment to be leased
  - One 12-inch self-priming solids handling pump (approximate capacity 3,800 gallons per minute (gpm)
  - Spill containment facilities (HDPE sheet with wood blocking)
  - 18-inch diameter HDPE suction piping (300 lineal feet (lf))
  - 12-inch diameter HDPE discharge piping (500 lf)
  - Cargo hose (four 20-lf sections with flanges)
  - Elbows and reducers as required
  - Connection hardware (e.g., bolts, quick-connect couplings, etc.)

- 4-inch x 12-inch x 12-inch tees
- 4-inch quarter-turn valves
- Drain piping from pilot-scale equipment and tank (miscellaneous sizes)
- Potable water piping (miscellaneous sizes)
- Noise dosimeter (1 week only)
- Two doppler-type ultrasonic flow meters
- John Deere 544 tractor with 3-cy bucket and forklift attachments
- Case tractor with 2-cy bucket

8.3 Task Mobilization/Demobilization

The pumping system will be designed and configured to provide sufficient flow to evaluate algae pumpability plus feed two rotary drum screens (up to 250 gpm each), one belt filter press (up to 250 gpm) and a 1,000-gallon storage tank. The proposed layout of the pumping system in combination with the belt filter press, rotary drum screens and tank are shown in plan view and schematically on Figures 5-3 and 5-4, respectively. The basic layout of the pumping system will involve an intake box, suction piping, pump, discharge piping to the lake and an outlet box. This configuration will allow evaluation of algae pumpability. Side-streams will be taken off the main discharge piping to convey water to the pilot-scale equipment and storage tank.

To meet the expected flow requirements, a single pump with a capacity of about 3,800 gpm will be used. The pump will be of the self-priming centrifugal type capable of handling a solids/air/water mixture. The pump will be diesel-powered; the unit will be placed within spill containment consisting of a heavy-duty HDPE liner and wood blocking. The pump will be located about 50 feet from the shoreline.

A steel intake box will be placed between approximately 150 feet and 200 feet offshore. The intake box will be oriented so that the opening faces west. Because the design of the intake box used for the 2001 demonstration may be susceptible to clogging under heavy algae conditions, a new intake box has been designed. The new intake box (see Figures 8-1 and 8-2) is designed to reduce the potential of inlet clogging and allow algae to pass more freely into the suction pipe. In addition, the intake box is designed to minimize cavitation and vortexing, and minimize sand scour at the box inlet. The intake box will have a 12-inch flanged connection. A

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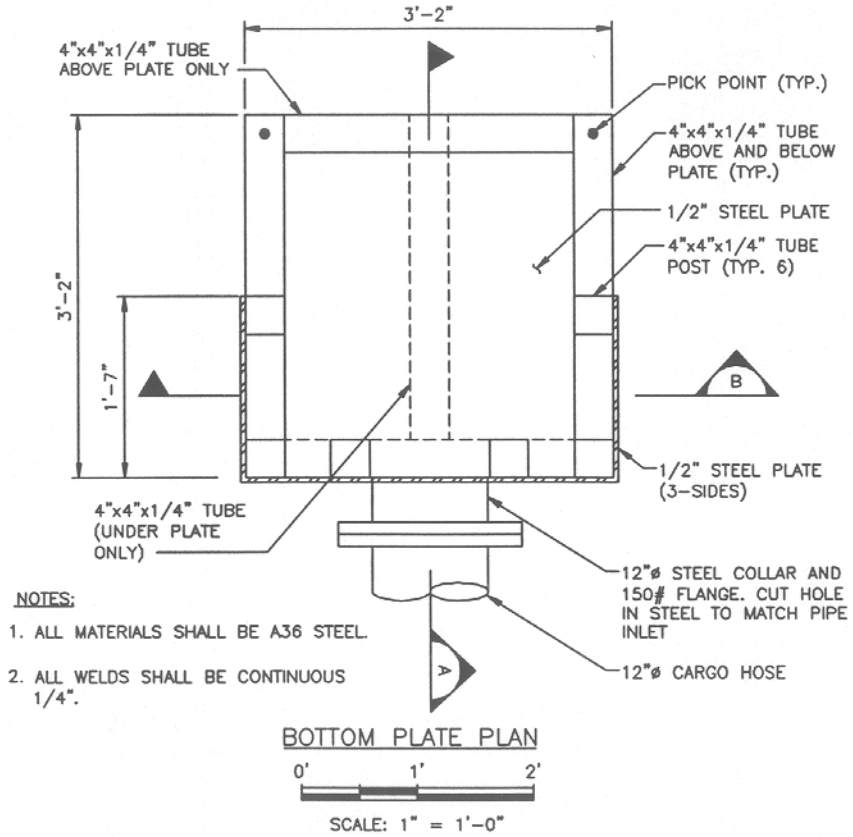


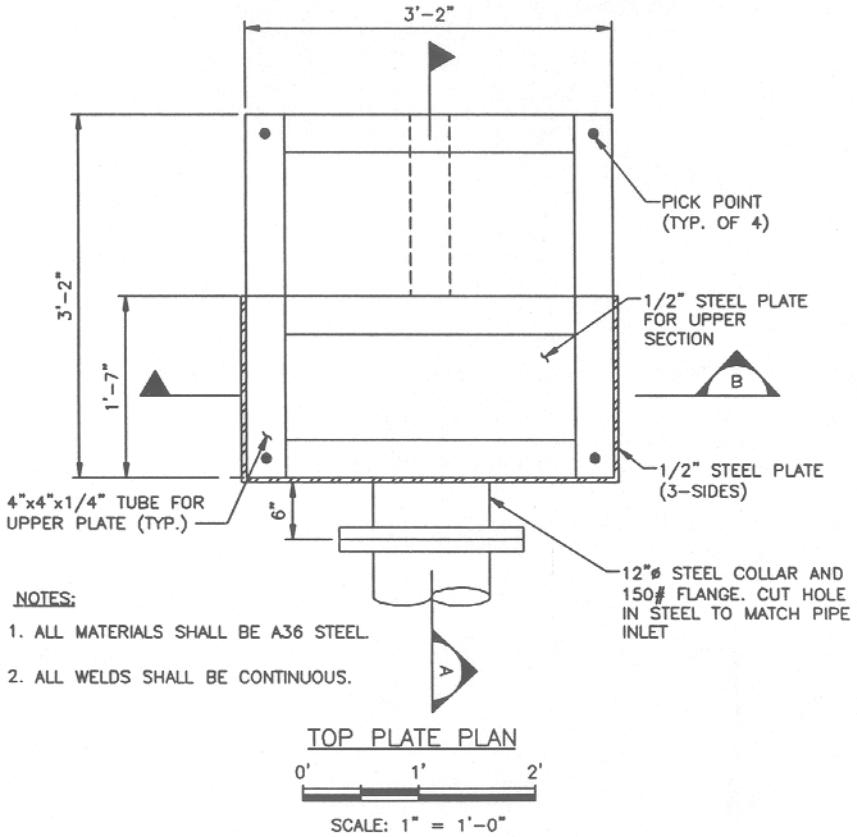
NOTES:

1. ALL MATERIALS SHALL BE A36 STEEL.
2. ALL WELDS SHALL BE CONTINUOUS 1/4".

BOTTOM PLATE PLAN

0' 1' 2'

SCALE: 1" = 1'-0"



NOTES:

1. ALL MATERIALS SHALL BE A36 STEEL.
2. ALL WELDS SHALL BE CONTINUOUS.

TOP PLATE PLAN

0' 1' 2'

SCALE: 1" = 1'-0"

INTAKE/OUTLET BOX BOTTOM PLATE AND TOP PLATE PLANS	
URS	FIGURE 8-1

CC-7270

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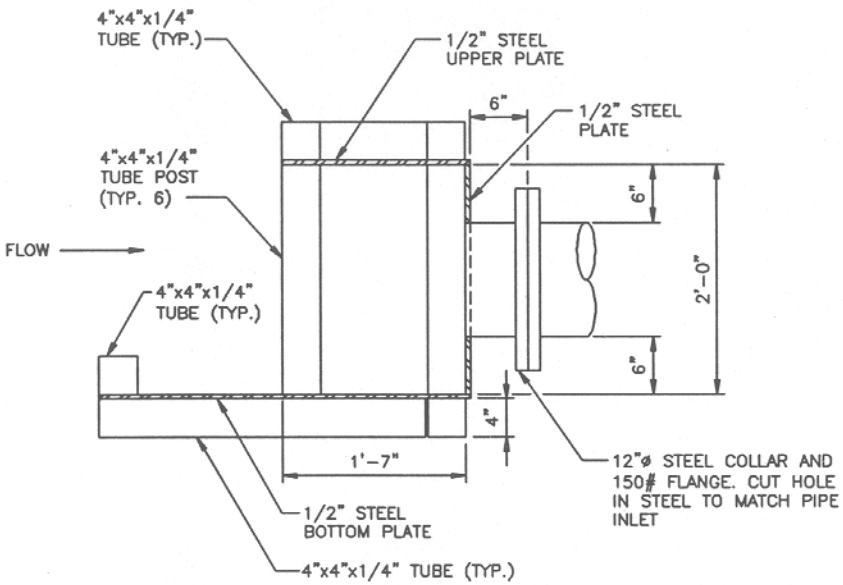
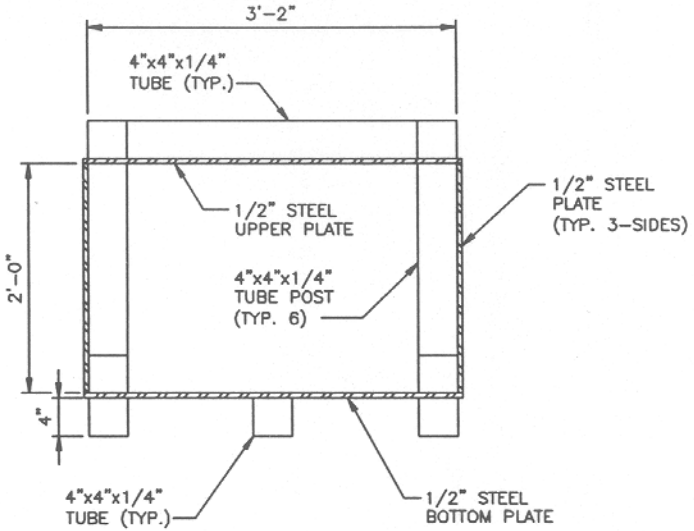


SECTION A

0' 1' 2'

SCALE: 1" = 1'-0"



SECTION B

0' 1' 2'

SCALE: 1" = 1'-0"

INTAKE/OUTLET BOX CROSS SECTIONS	
URS	FIGURE 8-2

CC-7271

12-inch flexible cargo hose will connect to the intake. An 18-inch HDPE suction pipe with 12-inch x 18-inch reducer will be connected to the cargo hose. The suction pipe will be connected to the pump via a second 12-inch cargo hose.

The pump will discharge into a 12-inch HDPE pipe. The pipe will loop back out into the lake where it will discharge via a steel outlet box located approximately 250 feet offshore. This will mitigate the need to route piping over the pier. Therefore, the pier will not be affected or require closure during the demonstration. The outlet box will be located further offshore than the intake box, and directed to discharge away from the inlet (i.e., northward), to prevent pump discharge from being recaptured by the intake. The box will have the same design as the inlet box. The discharge pipe also will be constructed with a vertical "U-shaped" section. This section will be designed to provide sufficient backpressure to allow side streams of discharge to be diverted to the pilot-scale test equipment and tank. The U-shaped section will include an air release valve and a blind flanged cleanout to remove algae that clog in the pipe section.

Four 4-inch x 12-inch x 12-inch tees will be installed in the discharge pipe to provide algae-laden water to the pilot-scale equipment and storage tank. Four-inch piping or hose with flanged or quick-connect coupling will connect the pilot equipment to the tees. Reducers and enlargers will be provided as required to meet equipment connection requirements. Two quarter-turn valves will be placed on each pipe to the pilot equipment; one shut-off valve to the tank will be provided. The valves will be used to manually control flow rate into the equipment.

A 1,000-gallon storage tank will be purchased to provide algae-laden water for the pumped algae measurements completed as described under Section 6.3. The tank will be fabricated of "translucent-white" low-density polyethylene. The tank will have an 87-inch diameter and be 51 inches high. It will be equipped with a 4-inch inlet with shut-off valve, 2-inch drain with shut-off valve and a 16-inch diameter hatch on top of the tank.

Parties involved with pumping system supply and installation will be URS, Monroe County, Godwin Pumps and Keeler Construction. These parties worked successfully together to implement the 2001 demonstration. URS will provide overall coordination of installation and pump testing as well as site supervision. Monroe County will provide vehicles and operators for installing the pumping system. The tractors used for testing existing and proposed equipment for

algae herding described in Section 7.0 will be used. Vehicle operation will include placement of pumps, piping and intake/outlet boxes.

Godwin Pumps will furnish the pumping equipment, piping and intake boxes. They also will furnish a pipe fusion machine and operator to fabricate piping on-site. Godwin also will be used to supply piping and valves as required under Sections 10.0 (Screening Evaluation) and 11.0 (Dewatering Evaluation), as well as the potable water piping described in Section 14.0.

Keeler Construction will provide general construction services for pump/piping installation and installation of the intake and outlet boxes, including rigging. Other tasks will include installation of the equipment for the screening and dewatering evaluations, site fencing, installation of a spill containment system, installation of pipe supports, installation of the electrical generator (including retaining an electrical subcontractor), disconnection/reconnection piping, and miscellaneous assistance.

8.4 Data Collection and Operation Plan

The Phase 2 demonstration components requiring pumping will be onsite between July 15th and August 15th, a period of 25 working days. The tractors required for mobilization are expected to already be onsite for the algae herding tests. Installation of the Phase 2 demonstration equipment will be from July 15th through July 19th. Testing of algae pumpability will be completed over the following 17 workdays. The final 2 to 3 working days will be used for demobilization.

Pumping will typically be performed between 6:00 a.m. and 2:00 p.m. to coincide with a typical 8-hour working shift. Normal algae herding activities across the entire beach performed by Monroe County will be between 6:00 a.m. and 9:30 a.m. Between 9:30 a.m. and 2:00 p.m., operations will be confined to the east end of the beach, where algae will be pushed to the intake box by a Monroe County equipment operator as part of work to remove algae from the water. Existing algae herding equipment will be used for this task. The pumpability test will involve pushing as much algae to the pump intake as possible. URS personnel will be responsible for operating the pumps and valves, and for arranging deliveries of fuel for the pump. Based on a

pumping average of 8 hours per day on weekdays, the pump will need to be refueled every other day.

Data collection and analysis will focus on visually identifying algae conditions that would result in significant reduction in flow or clogging of the pump. The pump being used is designed specifically for handling raw sewage, as would the pumps for a full-scale facility. However, the consistency of the algae may be such as to potentially build up in the pump impeller and reduce pumping efficiency. The other goal of data collection will be to provide a constant flow to the pilot-scale equipment. The following data will be recorded on a daily basis:

- Algae Pumpability Test
  - Time pumping is performed
  - Time algae pushing is performed and equipment number and type
  - Current weather and wind conditions
  - Discharge flow rate using doppler flow meter (once per hour)
  - Visual description of algae density and pumping operation

- Maintaining Flow to Pilot-Scale Equipment
  - Flow rate to each pilot scale unit using doppler flow meter (every two hours)

Periodic videotaping and photographs will be taken showing algae pushing to the pump, as well as flow of algae into the pump intake box and at the outlet box. In addition, a noise dosimeter (i.e., decibel meter) will be used during mobilization to evaluate noise impacts and establish a hearing protection zone around the pump and generator.

8.5 Evaluation Criteria

Pumpability will be evaluated by logging flow rates and visually determining the algae conditions, if any, that result in clogging or reduction of pumping capacity over time. These conditions include type of algae, algae density and loading rate of algae pushed to the intake box. This information will be used to determine the probability of algae causing pump clogging in a full-scale facility. This information also could be helpful in outlining how algae pushing can be performed to reduce the impact of algae on pumping operations.

8.6 Implementation and Coordination Issues

The following were identified as implementation and coordination issues that will need to be addressed during performance of the demonstration:

- Installation of the pumping system, particularly the delivery of equipment, will be coordinated with the City of Rochester construction project. A daily access route to and from the beach also will be specified.

- Placement of the pumping system as well as other pilot-scale equipment will be coordinated with daily algae herding and removal operations by Monroe County personnel. The equipment layout will allow for equipment to be placed in a manner to allow beach maintenance equipment to access the beach.

- Algae will be required for the pumpability test. An equipment operator will be needed to push algae towards the intake box to maintain the supply of algae to the pump. This activity must be coordinated with the operator's duties of removing algae from the beach.

9.0 ALGAE PUSHING TO SHORE AND HARD-SURFACE PLATFORM

9.1 Objectives

Discussions with Monroe County personnel indicate that one of the limiting tasks with current operations is bringing the algae out of the water and onto shore at the east end of the beach. Currently, park personnel place collected algae into a dumpster for removal. However, during periods of heavy algae, the capacity of the dumpster can be quickly exceeded, thereby requiring temporary onsite storage. This work effort will likely become more difficult as the new fast-ferry facilities are expected to reduce or eliminate locations where the algae can be temporarily stored prior to removal. Most likely, algae will need to be removed from site to mitigate nuisance odors and visual impacts. The additional time required for offsite removal could result in less algae being removed from the beach.

Currently, Monroe County pushes algae up onto shore and uses the tine machine with a bucket to remove algae from the water. After being allowed to drain on the beach for a period of time, the algae are loaded onto a 3-cy dump truck. On average, about six dump truck loads, or up to 18-cy, are brought onshore each weekday. However, maintenance personnel noted that much of the algae remain in the water during heavier algae days. The algae can migrate back into the swimming area or decay adjacent to the west pier, causing odor issues. In addition, the pushing operations result in loss of sand from the beach, particularly when a loader is used to lift the algae off the beach into the dump track.

Based on these operational issues, the two goals of this technology demonstration are to increase the amount of algae removed from the water and to minimize the loss of sand from the beach. In order to evaluate improved methods for pushing algae to shore, the following activities will be performed:

- Compare the use of existing equipment with the modified equipment used for algae herding operations (Section 7.0) to push algae onto shore.

- Evaluate the benefits of using a portable concrete platform to facilitate pushing algae onto shore and loading into a dump truck.

- Determine if a collection screen attached to a tractor would facilitate removal of algae and loading into a dump track.

- Evaluate the improvement in efficiency by using two operators instead of one.

- Evaluate the improvement in efficiency by adding and operating a second tine machine.

- Compare the amount of sand lost using the existing and proposed equipment, and estimate the reduction of sand loss by using a concrete platform.

9.2 Equipment Requirements

The following equipment is required for this pilot test.

- Equipment currently used by Monroe County to push algae:
  - Case 570XLT tractor with 1-cy clamshell bucket
  - New Holland TS110 tractor with a 1-cy bucket
  - Barber 600-HD surf rake (tine machine)
  - York Rake
  - 3-cy yard dump truck

- Equipment requiring purchase:

  - Barber 600-HD surf rake (tine machine). The manufacturer of the surf rake does not lease units. Therefore, a new unit will be purchased to permit the evaluation of a second tine machine. The cost of this unit is included under the algae herding demonstration task (Section 7.0).

  - Pre-cast concrete planks for the hard-surface concrete platform. The approximate size of the platform will be 16 feet wide by 40 feet long. Because of

the specialized nature of this demonstration, and wear and tear on the planks, the structural pieces require purchase.

- Steel algae collection screen. The collection screen will require purchase because it will be a custom design. It will be a vertical screen approximately 8 feet long by 4 feet wide.

- Equipment that will be leased:

  - John Deere 644 tractor with 3-cy bucket with teeth and clamshell. A set of forks would be provided to allow the tractor to be used for installing the concrete planks. Per request of Monroe County maintenance personnel.
  - Case loader with a 2-cy bucket w/teeth and clamshell, and a hand-throttle.
  - 12-foot Pro-Tech snow pusher

The cost of this equipment is included under the algae herding demonstration described in Section 7.0.

9.3 Work Task Mobilization/Demobilization

Much of the equipment needed for this task is already owned by Monroe County. Except for the hard-surface platform and algae collection screen, the equipment needs are similar to those for the algae herding work task described in Section 7.0.

The hard-surface platform would be constructed of precast concrete slabs. Possible manufacturers would be Reifler Concrete and Old Castle Concrete. The overall platform dimensions will be approximately 16 feet wide by 40 feet long. The platform will be installed at the shoreline, and will extend approximately 20 feet into the water to allow the platform to be used under varying daily lake elevations. The platform will consist of twenty 4-foot-wide-by-8-foot-long precast concrete slabs. This size will allow the platform to be installed using a John Deere 644 loader with forklift or 9-foot-wide bucket attachment, and will not be too bulky to transport through the park.

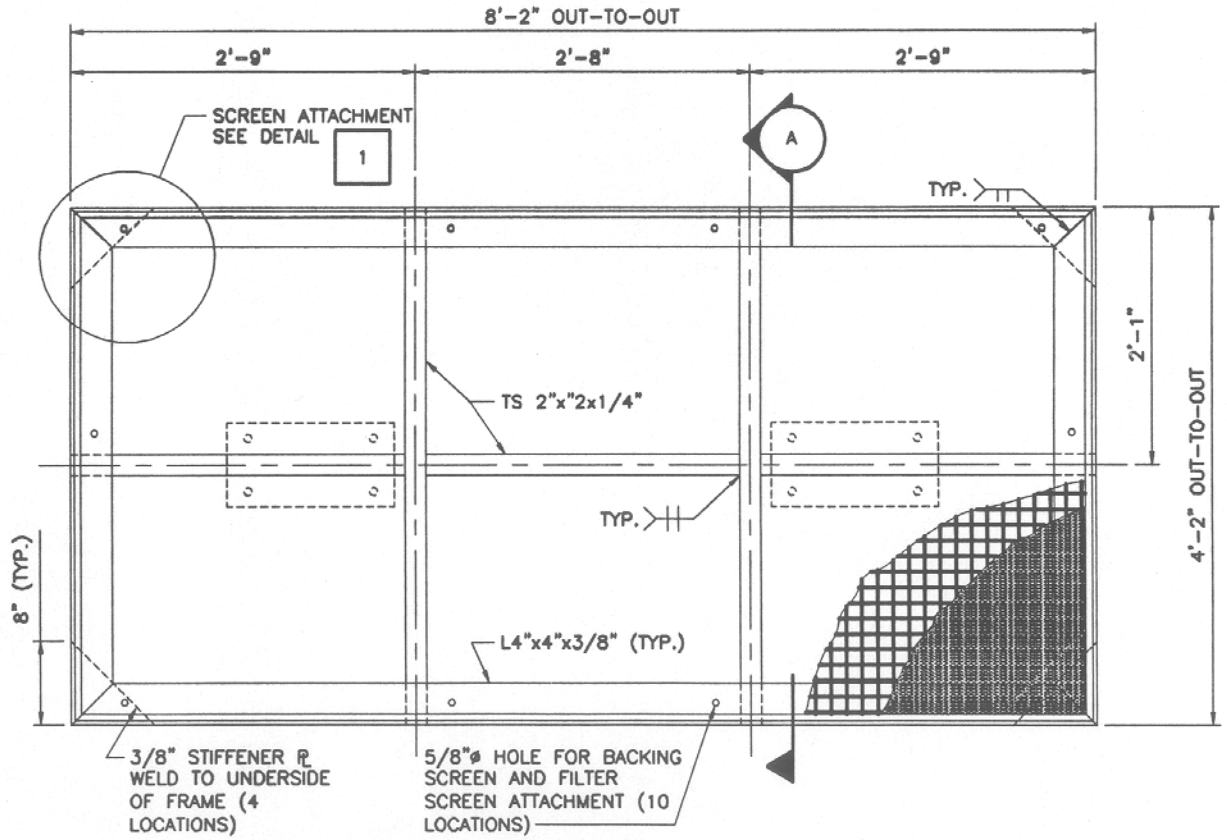
The concrete slabs will be placed directly on the sand and attached using mechanical connectors. Some minor grading of the sand will be required to place the slabs at a constant slope of approximately 1 foot vertical to 50 feet horizontal. A Monroe County equipment operator will be used to run the John Deere tractor. The concrete slabs will be installed over the first two days of Phase 1 and remain on the beach until the end of the summer. So as not to interfere with algae herding needs, the platform will be installed after 9:30 a.m. General construction assistance will be provided by Keeler Construction, which provided similar services for the 2001 demonstration.

The precast concrete slabs will be specified to withstand the weight of the John Deere 644 loader. The thickness of the slab will be between 8 and 12 inches. The hard-surface platform will be delivered to the site by June 21st. Manufacturers stated that the fabrication lead time for the platform is about four weeks. Therefore, the platform must be ordered by May 21st.

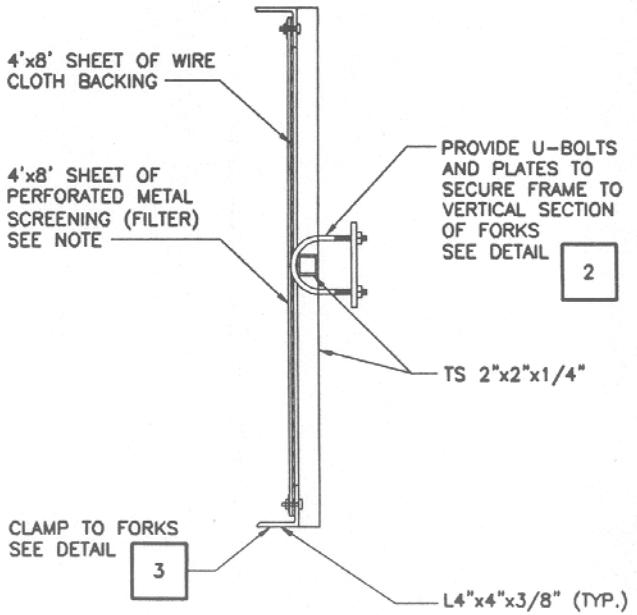
In addition to pushing to shore, removing algae directly from the water using a collection screen will be tested. The screen will be constructed of welded structural members and a mesh screen. The algae collection screen will be carried by the John Deere 544 tractor with a fork attachment to collect algae in the water. The screen is designed to be pushed through the water, brought to shore by the tractor and offloaded into a dump truck. When pushing through the water, the face of the screen mesh will be perpendicular to the water surface. Design sketches of the algae collection screen are shown on Figures 9-1 and 9-2. The screen is designed to allow replacement of the screen mesh, which will enable evaluation of different mesh sizes. It is anticipated that mesh sizes of 0.5 inches, 0.04 inches and 0.006 inches will be evaluated. The algae collection screen will be delivered to the site by June 15th. It is expected that a four-week fabrication lead time will be required. Therefore, the screen must be designed and ordered by May 15th.

A potable water hose will be provided to allow washdown of the concrete platform (see Section 14.0) and algae collection screen. The platform may also require adjustment or cleaning of sand after a storm event.

The concrete platform will remain on the beach until at least July 15th. If found to be successful, the platform could be used for the entire summer. The other equipment will be stored at one of the three locations previously identified: 1) at the east end of the beach, 2) at the park



ELEVATION
SCALE: 1"=1'-0"

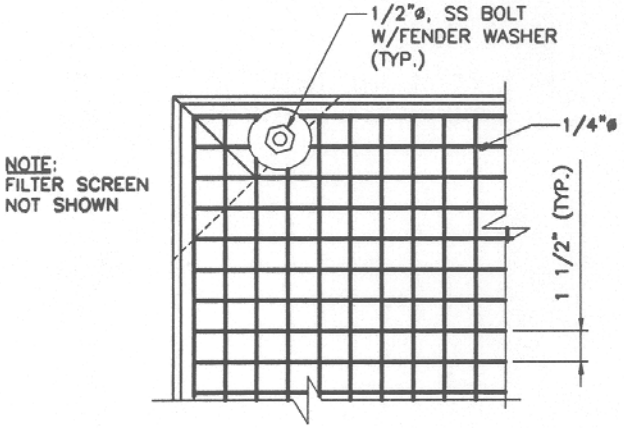


SECTION A
SCALE: 1"=1'-0"

NOTE:

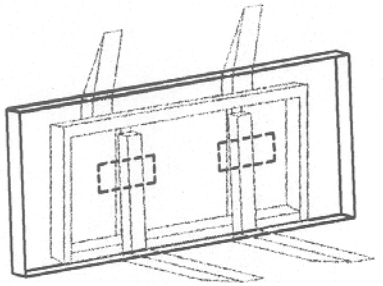
INTERCHANGEABLE FILTER SCREENS TO HAVE 5/64"ø AND 1/8"ø OPENINGS.

COLLECTION SCREEN ELEVATION AND SECTION	
URS	FIGURE 9-1



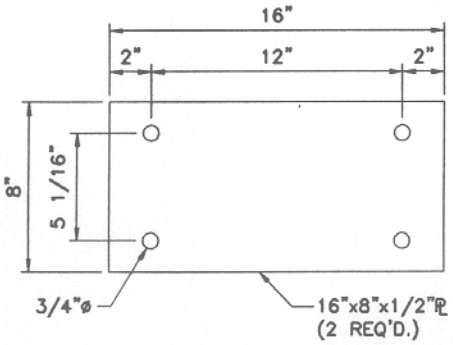
SCREEN ATTACHMENT DETAIL 1

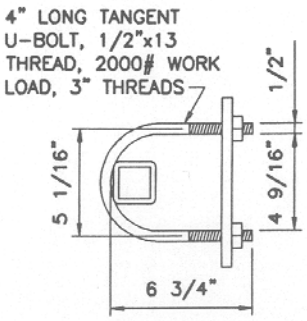
NOT TO SCALE



COLLECTION SCREEN MOUNTING DETAIL

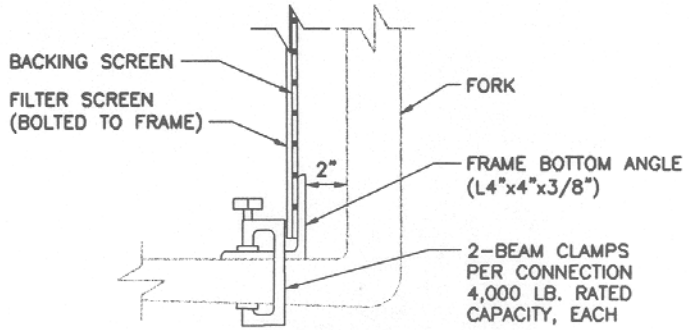
NOT TO SCALE





U-BOLT AND PLATE ATTACHMENT DETAIL 2

NOT TO SCALE



COLLECTION SCREEN TO FORK LIFT CONNECTION DETAIL 3

NOT TO SCALE

COLLECTION SCREEN DETAILS	
URS	FIGURE 9-2

maintenance garage, and 3) in the boat launch parking area. The storage location will be determined by Monroe County

9.4 Data Collection and Operation Plan

The algae pushing demonstration will be conducted between approximately June 15th and July 15th to parallel the algae herding efficiency evaluation. The demonstration will run daily regardless of quantity of algae in order to allow the operators to become familiar with the proposed equipment, and the operation of two pieces of equipment simultaneously.

As noted in Section 7.0, algae herding efficiency will typically be tested between 6:00 a.m. and 9:30 a.m. The algae pushing demonstration will be performed between 9:30 a.m. and 2:00 a.m. The algae pushing and collection equipment will be operated by up to two Monroe County equipment operators. The algae pushing demonstration will consist of a series of full-scale tests with a different configuration of existing and proposed equipment tested each day. The full-scale tests will substitute for current pushing operations. This will allow equipment operator(s) normally assigned to herding operations to be used for the test without impacting the County's ability to clear algae from the beach. If, during performance of a test, the pushing equipment configuration is found to be less effective than using existing equipment, the test for that day will be stopped in order for County personnel to collect the algae using existing equipment.

The goal of the demonstration is to maximize the number of truckloads of algae that can be removed each day while minimizing sand loss. Twenty-one working days (not including weekends and holidays) are available between June 15th and July 15th. One or two Monroe County equipment operators will be needed, as test requirements dictate. The first week of the demonstration will involve a screening of the following five general equipment configurations:

- Day 1: Use existing tractor and tine machine with one operator to perform pushing to shore. A second operator will operate the dump truck to allow delivery to the composting sites or for disposal. Install the hard-surface platform.

- Day 2: Use John Deere 644 tractor with one operator to perform pushing to shore. A second operator will operate the dump truck. Complete hard-surface loading platform as required.

- Day 3: Use existing tractor and tine machine with one operator to perform pushing onto the hard-surface loading platform. A second operator will operate the dump truck. Install the hard-surface platform.

- Day 4: Use John Deere 644 tractor and New Holland tractor with new tine machine to perform pushing onto the hard-surface loading platform. Another operator will operate the dump truck. Complete hard-surface loading platform as required.

- Day 5: Use John Deere 644 with forklift attachment and algae collection screen. Attempt to operate using two screen mesh sizes.

Tests will be conducted on the remaining 16 working days based on the performance of the first five days. Determination of subsequent equipment configurations will be based on visual observations and operator input. These additional tests may include the use of two algae pushing tractors (e.g., one for pushing and one for loading), the use of two tine machines, etc.

A data table will be prepared and completed by URS on a weekly basis. The data table will be used to log daily test conditions and observations. Specific information will include:

- Date of test
- List of equipment tested
- Time of operations
- Number of operators and listing of the function of each
- Weather and wind conditions
- Description of operation
- Number of truckloads of wet algae brought onshore
- Number of truckloads of wet algae trucked offsite
- The presence of algae remaining in the water at the end of the day

- Type of algae removed (as described by MCEHL in daily beach monitoring report)
- Visual estimation of the percentage of sand in each dump truck load
- In addition, videotape and photographs using a digital camera will be made of the algae being pushed to shore with and without using the hard-surface platform and the algae collection screen.

9.5 Evaluation Criteria

The data presented in Section 9.4 will be evaluated using the following criteria:

- The amount, in terms of truckloads, of wet algae removed from the beach under the various equipment configurations.
- The amount of sand, in terms of estimated percent, removed from the beach under the various equipment configurations.
- Time required to install and remove the hard-surface platform.
- Time to clean the algae collection screen.
- How the type of algae impacts removal of algae from the water for the different types of equipment configurations.

9.6 Implementation and Coordination Issues

The following implementation and coordination issues will be addressed during performance of the demonstration:

- The proposed algae pushing equipment will also be needed for algae herding operations described in Section 7.0. Platform installation and the pushing to shore tests will be performed after the algae herding tests have been completed for the day (after 9:30 a.m.).

- Because algae herding is likely to be the most critical element of this demonstration, the herding tests will take precedence over algae pushing to shore tests on days of heavy algae when the beach is closed.

- The proposed equipment will be needed full time to assist with mobilizing the pilot-scale equipment scheduled for testing between approximately July 15th and August 15th.

- An overnight storage site for the proposed equipment will need to be provided by Monroe County.

10.0 ALGAE SCREENING

10.1 Objective

The objective of this task is to evaluate if mechanical screening is a feasible technology for reducing the water content of algae prior to land treatment by composting or land disposal by landfilling.

The algae screening task will test algae pumped to two rotary drum screens with different size screen meshes. Evaluation of screening equipment includes the following:

- Perform bench-scale testing of algae screened through different mesh sizes to determine the mesh sizes to use for pilot testing, and to complement pilot testing to cover a wider range of mesh sizes.

- Identify operational issues associated with using a rotary drum screen, particularly size of screen, operator time, blinding, etc.

- Evaluate the need for multiple screens to account for a wide range of algae on a given day.

- Determine the typical (achievable) percent solids removal rates for various types and conditions of algae.

- Determine the minimum, maximum and average flux rates, as a function of run time and overall operating time.

10.2 Equipment Requirements

The following equipment will be required for this task:

- Equipment owned by Monroe County

- Tractors used for algae herding to assist with installation of the rotary drum screens
- Equipment operators to run the tractors
- Backhoe for removal of algae from the dumpsters

- Equipment requiring purchase
  - Anchor straps and rods
  - Support base (wood or masonry)
  - Sieves (8)
  - Scale (purchase under section 6.0)
- Equipment to be leased
  - Rotary drum screen (2 units)
  - Conveyor (1 unit)
  - 6-cy Dumpster (1 unit)

10.3 Work Task Mobilization/Demobilization

10.3.1 Bench-Scale Testing

Bench-scale testing will commence at the beginning of Phase 1 in order to select the mesh size for screens in the pilot test (Phase 2). When screen sizes are chosen, the rotary drum screen manufacturers will be contacted to provide screens with the appropriately sized mesh. Due to lead-time requirements for the rotary drum screens, the bench-scale testing will be performed as early as possible. A minimum of three samples of algae each will be collected for on-site and off-site testing to cover a variety of algae types and conditions. On-site sieve testing will be performed to find the range or ranges of mesh sizes most applicable to screening the various types of algae. Sieves for bench scale testing will be in the following approximate sizes: 2", 1", 0.5", 0.25", 0.1", 0.04", 0.006", and 0.0015". In addition, three samples of algae will be sent to the manufacturer to help determine the appropriate mesh sizes.

Bench-scale testing will continue two times per week during Phase 2 of the demonstration. As a supplement to pilot testing, bench-scale testing will allow evaluation of different mesh sizes for a wider variety of algae types and conditions than the two rotary drum screens used in the pilot test.

10.3.2 Pilot-Scale Testing

Two rotary drum screens with different screen sizes will be used for this pilot test. Skid-mounted units will be rented for use during Phase 2. The equipment is anticipated to be leased from the Parkson Corporation. Refer to Figures 5-3 and 5-4 for the equipment layout and schematic design, respectively. Various screen sizes will be used to evaluate their effectiveness on the different types and conditions of algae. Screen sizes for pilot testing are anticipated to be in the 150 μm (0.006-in) to 1 mm (0.04-in.) range. However, these sizes may change based upon bench-scale test results.

The algae-laden water will be pumped to the screens using a pump with an approximate flow rate of 3,800 gpm (see Section 8.0). A side stream from the pump discharge will be taken to provide flow rates ranging between 50 and 250 gpm to each drum screen. The screens will be operated in parallel, and the piping will be configured to allow each screen to be operated individually, or both at the same time. This set up will allow a range of flow rates to be tested, and the same influent to be tested on the two different screens. Effluent water will be returned to the lake via a drainpipe. Screened algae will be conveyed to a 6-cy dumpster using a 20-foot-long conveyor. A County-owned backhoe with operator will be used to transfer screenings from the dumpster into a 3-cy dump truck. Some residuals will be transported to composting facilities (see Section 12.0), and the rest will be disposed of by Monroe County.

Power requirements are 480V, three phase, 1.4 amp for each screen, which will be provided by a generator (see Section 14.0). Electrical cables will be routed between the screen control panels, conveyors, and the generator. Also required is wash water for the drum, which will be provided from a hydrant approximately 100 feet south of the boardwalk (Section 14.0).

During the algae screening test, URS will provide overall coordination of installation and testing as well as site supervision. Monroe County will provide equipment and operators for installing the screens, specifically the tractors used for the herding demonstration (Section 7.0). Keeler Construction will provide general construction services for installation of the rotary drum screens.

10.4 Data Collection and Operation Plan

The rotary drum screens will be used in Phase 2 of the demonstration project. During the first week of mobilization for Phase 2 (July 15th through July 19th), the drum screens will arrive and be set up on site. The leased tractor with forklift attachment will be needed to offload and place the skids. Start-up and operation will be over the following 17 days. The screens will be operated daily during the time the pump is operated, typically between 6:00 a.m. and 2:00 p.m. The final 2 to 3 working days will be for demobilization. The equipment will be packed and shipped back after the operation is completed. A wastewater treatment plant operator – specializing in sludge dewatering equipment – will be furnished by Monroe County for the duration of testing to assist with operating the screens and the filter press.

Bench-scale testing for size analysis will be done both prior to pilot testing and during pilot testing. This testing will be done on site, using a sieve stack of six sieves, and a mechanical balance. A 0.5-gallon sample of algae will be taken from the water, weighed, and poured on the sieves. After allowing water to drain, the algae on each sieve will be weighed. The distribution of algae on the various sieves will be found. During the beginning of Phase 1, a minimum of three samples will be taken for size analysis to aid choosing mesh sizes for pilot testing. During Phase 2, a minimum of two samples per week will be taken to complement pilot testing.

In addition to the data collection described in Section 6.0, additional analytical tests are needed to evaluate the rotary drum screen operation. Samples will be taken from the influent, residuals, and screened water. The influent samples will be taken from algae-laden water pumped to the 1,000-gallon tank. Residuals are the dewatered algae collected at the discharge of the rotary drum screen. Screened water is the water separated from the algae during the screening process.

Data to be collected during the operation of the rotary drum screen include:

- Total solids of influent sampled from the 1,000-gallon tank
- Total suspended solids (dry-weight basis) of screened water sampled from the effluent pipe

- Total solids content of residuals sampled from the rotary drum screen discharge or conveyor
- Flow rate at which the screens are operated, and dates and times operated
- Down time of screen due to blinding or other operational problems, including photographic documentation

Samples will be collected daily for 10 days. Three samples (influent, screened water, and residuals) will be collected each day from each screen, for a total of 60 samples. One-liter samples will be taken. The total solids tests will need 1-liter samples, and the total suspended solids test will require 100 ml. As noted, these samples are in addition to those described in Section 6.0. Total suspended solids and total solids content will be analyzed by the EHL.

Data collection will include visual observation of influent, residuals, and screened water, volume of algae collected in the dumpsters, and the screen operating efficiency and any problems encountered.

10.5 Evaluation Criteria

The use of rotary drum screens will be evaluated with respect to its efficiency and ease of operation. Criteria used to evaluate the rotary drum screens include:

- Removal efficiency
- Percent solids of screened algae for different types and conditions of algae
- Flow rate
- Flux (gallons per minute per square foot)
- Screens for different algae conditions
- Operational issues
- Maintenance requirements

10.6 Implementation and Coordination Issues

Coordination with Monroe County personnel is necessary for transporting the rotary screen equipment from the delivery point to the beach and placing the equipment on the beach. The rented John Deere 644 loader will be required to place the equipment. Coordination with the City of Rochester construction project will also be necessary to transport equipment to the beach. An operator from a County treatment plant is needed to assist with operation of the rotary screen equipment. At the end of the demonstration, equipment will be required to transport the equipment to the pick up area. In addition, coordination with EHL personnel will be required for conducting analytical tests.

11.0 ALGAE DEWATERING

11.1 Objective

The objective of this test is to evaluate if mechanical dewatering of algae is a feasible technology for reducing the water content of algae prior to land treatment by composting or land disposal by landfilling.

A belt filter press will be used to evaluate mechanical dewatering. The evaluation of the belt filter press includes the following:

- Bench-scale testing to evaluate the ability of different types of filter belts to dewater algae to determine the pilot equipment to use, and to provide supplemental information to evaluate the ability to dewater under various algae conditions. During bench-scale testing, chemical pretreatment requirements such as use of polymer will be determined.

- Identification of operational issues associated with using a belt filter press, particularly type of belt, tension of rollers, operator time, blinding, sticking to filter cloth, maximizing use of chemical addition, etc.

- Determination of the typical (achievable) percent solids removal rates for various types and conditions of algae.

- Determination of minimum, average and maximum flux rates as a function of run time and overall operating time.

11.2 Equipment Requirements

The following equipment will be required for this task:

- Equipment owned by Monroe County

- Tractors used for algae herding to assist with installation of the belt filter press
- Equipment operators to run the tractors
- Backhoe for removing algae from dumpsters

- Equipment to be leased or purchased
  - Belt filter press to be leased
  - Polymer to be purchased
  - Dumpster to be leased

11.3 Work Task Mobilization/Demobilization

11.3.1 Bench-Scale Testing

Bench-scale testing will commence at the beginning of Phase 1 in order to select the conditioning requirements in the pilot test (Phase 2). Three- to five-gallon samples of the range of types and conditions of algae will be taken and sent to the manufacturer's laboratory for this testing. Three samples are anticipated to be collected. Testing will be performed to evaluate if polymers will improve dewatering. Because of lead-time requirements of the belt filter press, the bench-scale testing will be conducted as early as possible.

Bench-scale testing will continue during Phase 2 of the demonstration. As a supplement to pilot testing, bench-scale testing will evaluate a wider variety of algae types and conditioning requirements.

11.3.2 Pilot-Scale Testing

A belt filter press and associated equipment will be used for this pilot test. The press, delivered on a trailer approximately 45 feet long, will be rented for Phase 2. Equipment such as a polymer feed system, dilution panel, pumps, and an electrical panel is included on the trailer. The equipment is anticipated to be leased from Roediger Pittsburgh or BDP Industries. Refer to Figures 5-3 and 5-4 for the equipment layout and schematic design, respectively.

The algae-laden water will be pumped to the belt filter press using a pump with an approximate flow rate of 3,800 gpm (see Section 8.0). A side stream from the pump discharge

will be taken to provide flow rates up to 250 gpm. It is anticipated that polymer will be needed. Most of the polymer is anticipated to bind with the algae. The polymer type and manufacturer will be selected using bench-scale testing. Filtrate will be returned to the lake via a drainpipe. Dewatered algae will be conveyed to a 6-cy dumpster via a conveyor integral to the filter press trailer. A County-owned backhoe with operator will be used to transfer dewatered algae from the dumpster into a 3-cy dump truck. Some algae will be transported to composting facilities (see Section 12.0), and the rest will be disposed of by Monroe County.

Power requirements are three phase, 480V, 80 amp, which will be provided by a generator (Section 14.0). Electrical cables will be routed between the press control panel and the generator. Potable water for polymer dilution and press cleaning will be provided from a hydrant approximately 100 feet south of the boardwalk (Section 14.0).

During the algae dewatering test, URS will provide overall coordination of installation and testing as well as site supervision. Monroe County will provide equipment and operators for installing the press, specifically the tractors used for the herding demonstration (Section 7.0). The tractors will be required during the first week of Phase 2 plus the last week for demobilization. Keeler Construction will provide general construction services for installation of the belt filter press.

11.4 Data Collection and Operation Plan

The belt filter press will be operated during Phase 2 of the demonstration project. During the first week of mobilization for Phase 2 (July 15th through July 19th), the filter press will arrive and be set up on site. The leased John Deere 644 tractor with forklift attachment will be used to assist in set up of the equipment. The following three working days will be devoted to start-up and training. The press will be operated for approximately 14 workdays. At the conclusion of the testing, the press will be cleaned, prepared for shipment, and shipped back to the manufacturer. The press will be operated daily during the time that the pump is operated, typically between 6:00 a.m. and 2:00 p.m. A wastewater treatment plant operator – specializing in sludge dewatering equipment – will be furnished by Monroe County for the duration of testing to operate the filter press.

Bench-scale testing to evaluate the ability to dewater various types of algae will be conducted both prior to and during pilot testing. Samples of three to five gallons will be sent to the manufacturer's laboratory for testing. In the beginning of Phase 1, three samples will be taken and sent to the manufacturer to evaluate polymer addition. To supplement the pilot testing, three additional samples will be collected and sent to the manufacturer's laboratory during pilot testing.

In addition to the data collection described in Section 6.0, additional analytical tests are needed to evaluate the belt filter press operation. Samples will be taken from the influent, residuals and filtrate. The influent samples will be taken from algae-laden water pumped to the belt filter press influent tank. Residuals are the dewatered algae collected at the discharge of the belt filter press. Filtrate is the water separated from the algae during the process.

Data to be collected during the operation of the belt filter press include:

- Total solids of influent sampled from the belt filter press influent tank
- Total suspended solids (dry-weight basis) of filtrate sampled from the effluent pipe
- Total solids content of residuals sampled from the belt filter press discharge or conveyor
- Flow rate at which the press is operated, and dates and times operated
- Amount of polymer added, if any, and dates and times added
- Down-time of press due to blinding or polymer dosing, including photographic documentation

Samples will be collected daily for 10 days. Three samples (influent, filtrate, and residuals) will be taken each day, for a total of 30 samples. One-liter samples will be collected. The total solids tests will need 1-liter samples, and the total suspended solids tests will require 100 ml. As noted, these samples are in addition to those described in Section 6.0. Total suspended solids and total solids content will be analyzed by the EHL.

Data collection also will include visual observation of influent, residuals, and filtrate, volume of residuals collected in the dumpster, the operating efficiency and any problems encountered, and odor observance.

11.5 Evaluation Criteria

The use of the belt filter press will be evaluated with respect to its efficiency and ease of operation. Criteria used to evaluate the belt filter press include:

- Water removal efficiency
- Percent of solids of dewatered algae for different types and conditions of algae
- Flow rate
- Flux (gallons per minute per square foot)
- Belt medium
- Amount of polymer used
- Operational issues
- Maintenance requirements

11.6 Implementation and Coordination Issues

The belt filter press and equipment comes complete on a trailer which will be delivered to the site. Coordination with Monroe County is necessary to help install the trailer. Also, coordination with the City of Rochester construction project is needed to transport the trailer through the park. An operator from a County treatment plant who is experienced with belt filter presses will be used to operate the equipment. Also, coordination with EHL personnel will be required for conducting analytical tests.

12.0 OFF-SITE ALGAE COMPOSTING

12.1 Objective

The objective of this task is to determine the feasibility of composting algae for beneficial uses. The composting study will evaluate the decomposition of algae that is delivered to either the Town of Greece Yard Waste Compost Facility (GYWCF) or the Gates-Chili-Ogden Sewage Treatment Plant (GCOSTP) under three conditions: (1) drained algae (at least 1 hour prior to delivery), (2) screened algae from the rotary screen evaluation, and (3) mechanically dewatered algae from the belt filter press evaluation.

The composting feasibility study will be performed to determine whether algae can be safely and effectively composted using two alternate methods:

Method #1 - Stand-Alone Composting – Algae will be composted under all three conditions at the GCOSTP without the addition of any bulking agents/materials or finished grinding. The purpose of this study will be to determine if algae can be composted by itself and under variable initial moisture conditions, and the beneficial use(s) that can result from reusing the cured product.

Method #2 - Co-Composting – Approximately 50 cubic yards of drained algae (Condition 1) will be co-composted at the GYWCF with about 50 cubic yards of yard waste that consists of leaves and grass clippings. The purpose will be to determine if algae can effectively be co-composted with yard waste.

12.2 Equipment Requirements

For each composting method, equipment and operators will be provided by Monroe County, unless otherwise indicated below.

Method # 1- Stand-Alone Composting at GCOSTP

- 3- to 4-cy bucket front-end case loader with operator
- Reo-temp thermometer (to be provided by URS)
- Scarab turner with operator

Method #2 – Co-Composting at GYWCF

- All compost processing equipment will already be provided and in use at the GYWCF.

12.3 Operational Parameters and Requirements

The compost pilot test for both methods will be performed in three phases that cover pre-composting, composting and post-composting. Each of these phases is described below.

12.3.1 Phase 1 – Pre-Composting Phase

This phase will cover initial testing of the algae to determine if it is safe for handling and processing. Table 6.1 indicates the tests that will be performed for this purpose. Should any of the tests indicate high bacterial/pathogen counts beyond what is acceptable for sewage sludge and/or be considered toxic/contaminated beyond what is allowable for beneficial end uses (as defined in Part 360 of the New York State Environmental Conservation Laws), composting will not be performed. Rather, the algae will be sent to an appropriate landfill for disposal.

12.3.2 Phase 2 – Composting Phase

The actual process of composting will be executed under this phase. The operational parameters for each method are described as follows:

Method #1 - Stand-Alone Composting – As previously mentioned above, the algae will be transported by Monroe County to the GCOSTP under three conditions: (1) drained algae (at least 1 hour prior to delivery), (2) screened algae from the rotary screen evaluation, and (3) mechanically dewatered algae from the belt filter press evaluation. To effectively assess algae decomposition for each of these conditions, the following operations will be performed:

a. Algae generated from each condition will be individually stockpiled in three windrow areas. Each windrow pile will be approximately 12 feet wide, 5 feet high, and 30 feet long. The windrow piles will be allowed to cure (decompose) in place for up to 12 months. The algae in each pile will be inspected every month by URS. The inspection will include assessing color, strength of odor, resistance to ripping, moistness, and attraction of bugs/vermin/birds to the algae.

b. During the monthly inspections, commencing with the initial placement of algae, the windrow piles will be monitored by URS for pH, temperature and oxygen. The pH, temperature and oxygen measurements will be recorded for the length of the compost period. Weather conditions for each monitoring day will also be recorded. URS will review the monthly test results to evaluate the progress of the composting process. If so indicated by the test results, URS will instruct Monroe County personnel to provide additional turning of the windrows (see following.)

c. Each windrow pile will be turned twice per month by Monroe County using their Scarab turning machine.

d. If odors become a nuisance, as indicated during the monthly inspections or by complaints from neighbors or plant workers, URS will instruct Monroe County personnel to add lime to the windrow piles. If the odor problems persist, the project will be terminated and Monroe County will dispose of the compost materials at an offsite landfill.

e. Moisture content and carbon/nitrogen (C/N) ratios will be analyzed in samples from each of the windrows at the start of the composting project, midway through, and at the completion of the curing process. Sampling will be performed by URS during monthly inspections, and analyses will be performed by the Monroe County EHL. Along with the other test results, these data will be used to evaluate whether the turning frequency is sufficient, and when curing is complete.

Method #2 - Co-Composting – Approximately 50 cubic yards of drained algae (Condition 1, Section 12.1) will be transported by Monroe County to the Town of Greece Yard Waste Compost Facility. Once onsite, Town personnel will mix the algae with about 50 cubic yards of yard waste compost, then place the mixture into a separate windrow pile for curing. The curing process is expected to last up to 12 months. Town personnel will turn the algae windrow at the same frequency that they turn the other yard waste compost windrows at this existing facility. URS personnel will conduct monthly inspections and perform the same testing as they do for stand-alone composting at the GCOSTP.

12.3.3 Phase 3 – Post Composting (Evaluation) Phase

After the 12-month curing process has ended, all three of the Method #1 (stand-alone composting) windrow piles at the GCOSTP, and the single Method #2 (co-composting) windrow pile at the GYWCF, will be evaluated for nutrient availability. Nutrient content will be compared with that typically found in yard waste and sludge compost, and considered in evaluating whether the algae compost is suitable for beneficial end use(s) in lieu of landfilling.

12.4 Evaluation Criteria

The success of the algae composting study will be evaluated in terms of the following parameters (see Table 6-1):

- Pre-compost phase analyses of bacteria (fecal and total coliform), total metals, fats/oils/greases, pathogens (salmonella and botulism), pesticides, herbicides, PCBs and PCP, to establish initially whether the algae is suitable for composting.

- Re-analysis for bacteria and pathogens after curing to insure that these parameters will not prevent beneficial use of the compost product.

- Composting phase field measurements of pH, temperature and oxygen on a monthly basis, observations during monthly inspections, and periodic analyses of moisture content and carbon/nitrogen ratio, to determine the operational feasibility of the process, i.e., whether microbial activity is sufficient to compost algae within a reasonable (12-month) time frame.

- Post-composting phase analysis of soil nutrients (NO_3, NH_4, P, K, Ca, Mg) to determine the suitability of the end product for use in lawn and garden fertilizer products.

12.5 Implementation and Coordination Issues

URS personnel will coordinate site visits, testing and operational adjustments (e.g., turning frequency, lime addition) with Monroe County and Town of Greece staff. These municipalities will be responsible for actual composting operations, including the provision of equipment and operators, and for the final use or disposal of the composted end product after test completion. URS will perform all sampling and testing for the demonstration project. The Monroe County EHL will be responsible for all required laboratory analyses (Table 6-1). Schedules will be developed with each facility prior to the commencement of the composting demonstration project.

13.0 PLUME DELINEATION MODELING

13.1 Objectives

Alternative 11 of the Rochester Harbor Feasibility Study involves modified algae herding operations at Ontario Beach, followed by pumping of herded algae into either the Genesee River or Lake Ontario at the offshore end of the west pier. This alternative requires the discharge of sometimes large volumes of algae into the River or Lake, with potentially adverse environmental impacts upon both water bodies, as well as downstream landowners to the east of the Genesee River. Although these potential impacts will be mitigated to a considerable degree by dilution and dispersion of algae within the River and Lake, their residual effect is uncertain. The objective of this task is to delineate the algae plume by numerical modeling, and thereby evaluate its impact upon the aquatic environment and downstream properties. Two forms of modeling will be employed: (1) hydrodynamic modeling to evaluate the current field (i.e., mass movement of water) under variable wind and river flow conditions and (2) water quality modeling, as an adjunct to hydrodynamic modeling, to evaluate the fate and transport of algae within the flow field. The following sections address the hydrodynamic model, the collection of current measurements for use in calibrating the hydrodynamic model, and the water quality model.

13.2 Hydrodynamic Model

A hydrodynamic flow model will be used to evaluate the flow field transporting algae discharged to the Genesee River or to Lake Ontario at the end of the west pier. The flow model will utilize, to the extent practical, the model utilized previously for the FS, with the domain expanded as necessary to include the beach areas east of the Genesee River that could be affected by algae discharge. The model domain will be extended 3 to 4 miles to the east and west of Ontario Beach and approximately 3 miles seaward of the shoreline. Bathymetry and shorelines will be established based on publicly-available data sources (navigation charts, USGS surveys or other paper or digital files).

The flow model under this task will address algae as a “conservative” contaminant (i.e., one that moves with the flow field without degradation or decay). This is the most conservative approach to mapping an area of impact because dilution, degradation, dispersion and other

possible mechanisms will lessen the concentration and potential impacts of discharged algae at ultimate destinations. To bracket a range of potential current-driven conditions, 12 simulations will be performed. Combinations of the following will be modeled: three river discharge rates (no flow, mean summer and high summer flow rates), two wind speeds (mean summer and higher sustained rates), and two wind directions (wind from the northwest and from the northeast). Vector plots of flow will be produced for each case. Difference contour plots will also be developed illustrating the difference between each of the river discharge cases versus the no flow condition. This will emphasize the areas of the lake where river discharge effects are delineated by the model, and to what magnitude they are impacted.

The flow model will be the same as that used in prior hydrodynamic simulations at Ontario Beach. The model will contain Coriolis forcing. A particle-tracking algorithm will be implemented to illustrate the path of a water particle moving with the flow out of the river and through the lake.

The model will be based upon the assumption that the primary transport mechanism is current-driven, rather than wave-driven. Since most of the transport will be outside the surf zone and during the calmer summer season, this should be a reasonable assumption.

13.3 Field Current Measurements and Model Calibration

In order to calibrate and validate the results of the hydrodynamic model, current data will be collected during two 2-day periods over a total 8-day time frame. An acoustic Doppler profiler (ADP) will be mounted on a boat hired locally. The boat will have cabin space for a data collection computer for both the ADP and Global Positioning System (GPS). A gasoline-powered generator will be placed on board to guarantee uninterrupted power for the ADP and the GPS. The ADP and GPS will supply time-synchronized current and boat position data as the vessel moves out of the river and into Lake Ontario. The boat will zigzag across the river plume as it leaves the river mouth and into the Lake. The measured currents (automatically adjusted for vessel speed by the bottom-tracking algorithm running on the computer) will provide detailed knowledge of the current speed and direction downdrift of the river mouth. Because the ADP is a current profiler, the vertical profile of current will be measured at all times, giving an indication

of the uniformity (or shear) of current through the water column. The current profile will provide an indication of whether algae could be expected to sink to depths or move with the flow field.

As indicated above, field measurements will be performed over two 2-day periods during an 8-day time frame in an attempt to capture conditions of two different wind directions or significantly different wind speeds. As discussed in Section 6.0, water samples will also be collected during the current measurements for use in the development and calibration of the water quality model. Also, real-time measurements of conductivity, temperature and salinity (C-T-S) will be obtained using a C-T-S meter.

13.4 Water Quality Modeling

A numerical model will be developed to simulate several water quality parameters in the Genesee River and in Lake Ontario. The model domain will include the downstream reach of the Genesee River (approximately 2,500 feet) before it discharges into Lake Ontario, and the discharge region in Lake Ontario already being modeled for hydrodynamics. The primary processes to be modeled are transport of an algal "slurry" that is proposed to be pumped into the river from the beach area immediately to the west of the river, and dissolved oxygen (DO) dynamics. For simplicity, algae transport will be modeled as a passively settling solid only (i.e., algal growth dynamics will not be included in the present model, but may be added at a later date, depending on project needs). The DO component will include biochemical oxygen demand (BOD), reaeration, sediment demand (from settling algae), and temperature, obtained from field measurements. The model will be linked with the hydrodynamic model already formulated and will use output from that model for transport and mixing coefficients. The water quality model also will be run using the same spatial and temporal resolution as the hydrodynamic model. Specific conditions to be used for model validation and for predictive (or descriptive) simulations will be determined as the project proceeds. In addition to the modeling, settling column experiments will be conducted at the State University of New York at Buffalo (SUNYAB) Department of Civil and Environmental Engineering to determine basic settling rates for the algae slurry needed in the algae transport model.

13.5 Equipment and Operational Requirements

All of the equipment required for plume delineation modeling will be provided or rented by URS and its subcontractors, including: a large boat with cabin space for an onboard computer, a current meter (ADP) with GPS locating capability, a C-T-S meter, and a generator. The Monroe County EHL will provide jars and containers for water quality sampling, which will be performed simultaneously with current measurements but under the "Measurements of Algae and Environmental Parameters" task (Section 6.0). Samples for the column settling tests at SUNYAB, which are a part of this task, will be collected by URS from the pumped algae tank at Ontario Beach.

13.6 Implementation and Coordination Issues

Coordination will be required between URS and EHL personnel for the delivery and pickup of sample bottles and containers during the two sampling events scheduled under this task.

14.0 OTHER DEMONSTRATION ELEMENTS

14.1 Site Utility Requirements

14.1.1 Electricity

The pilot-scale rotary drum screens, belt filter press and associated conveyors have significant electrical requirements. For example, the belt filter press will require 3-phase, 480-volt, 80-ampere power service. Because of the location of the work site, these power requirements are not expected to be readily available at the existing park facilities. Therefore, a 225-kilowatt portable generator and associated cables and tapping supplies will be provided for Phase 2 of the demonstration. The generator and electrical equipment is expected to be supplied by Syracuse Supply. The generator will be diesel-powered and have a protective housing. The unit will be capable of supplying 240/480-volt power simultaneously to six pieces of equipment requiring an 80-ampere current. The generator will be placed in the same fuel containment area as the pump. Ground rods will be installed for the generator. The electrical cables used for providing power will be suitable for exterior service (e.g., entertainment cable). A single set of three 4/0 cables will loop around the equipment requiring power. This loop will be tapped to provide power to the individual equipment. Additionally, the cables will be covered with sand to minimize exposure of workers. Keeler Construction will provide an electrical subcontractor to install the power cable. URS will call in a fuel truck as required for the generator.

Low voltage (110-volt) power will be made available by Monroe County at a nearby park shelter.

14.1.2 Potable Water

As described in Sections 8.0 through 11.0, potable water will be required for the demonstration. The potable water piping system for the demonstration is shown on Figures 5-3 and 5-4. Sufficient potable water will be provided from a hydrant located about 100 feet south of the boardwalk. A backflow prevention device will be installed on the hydrant. A 3-inch nylon fire hose will be used to convey water from the hydrant to the beach. The fire hose can be run over by vehicles without being damaged and can be quickly removed from the hydrant each

night. The City of Rochester was contacted regarding use of the hydrant and agreed, providing that a backflow prevention device is used. Godwin Pumps will provide the piping and connection hardware for the potable water piping system. Keeler Construction will install the piping. URS will remove the hose from the hydrant on a daily basis and operate the hydrant.

14.2 Common Equipment Requirements

As part of the Summer 2002 demonstration, the following equipment will be provided for the duration of the project:

- Hard hats for URS personnel, subcontractors and visitors (10)
- Hearing protection
- Hip waders (2 pairs)
- Cell phone
- Tool box
- Measuring tape (30 feet and 100 feet)
- Boat with paddles (12 feet minimum, shallow draft)
- Safety vests (2)
- Life jackets (3)
- Sample bottles (see Section 6.0)
- Sample collection equipment (see Section 6.0)
- Stationary and data collection forms
- Lap top computer with MS Office suite
- Coveralls (2)
- Thermometer
- Digital camera
- Film camera (backup)
- Orange cones (6)
- Rope (200 feet)
- Video recorder and videotapes

14.3 Public Relations Plan

The USACE and Monroe County will be responsible for public relations. If approached, URS will refer the interested party to USACE/Monroe County authorized personnel.

14.4 Accident Prevention Plan

An accident prevention plan will be developed as a document separate from this work plan. The accident prevention plan will encompass all of the demonstration work tasks.

14.5 Site Security

During Phase 1, the large equipment will be stored away from the demonstration site and brought to the beach on a daily basis. Only the hard-surface loading platform will be on the beach between June 15th and July 15th. Therefore, no special security measures are anticipated for Phase 1. However, a significant amount of equipment will be placed on the east end of the beach during Phase 2. This equipment could be subject to vandalism if left unattended. Burns Security will provide a guard 24 hours per day at the project site between July 15th and August 15th to provide crowd control and limit access to the work site.

14.6 Reporting Requirements

The scope of the Summer 2002 Demonstration Project does not include a formal report or evaluation. However, data and information produced during each phase of the demonstration will be collected, tabulated on an ongoing basis, and provided to the USACE at the completion of the project as a summary data package. In addition, the hydrodynamic and water quality models (Section 13.0) will be presented in a combined report, which will be submitted at the completion of the modeling studies. The cost for each of these deliverables is included under the respective demonstration tasks.